United States Department of Agriculture
Forest Service

Forest-Wide Invasive Plant Treatment Project

Environmental Assessment

INYO NATIONAL FOREST
Fresno, Inyo, Madera, Mono, and Tulare Counties, California
Esmeralda and Mineral Counties, Nevada

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Cover Photos (clockwise from top left): Tamarisk resprouting following initial cut-stump treatment at Oak Creek; Digging up spotted knapweed with local high school student volunteers in Bishop Creek drainage; Dead perennial pepperweed following herbicide wiping near Jordan Hot Spring; Hoarycress spreading along a trail near Mono Lake.

Table of Contents

1. Introduction

1.1 Document Structure

The Forest Service (FS) has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and state laws and regulations. This Environmental Assessment (EA) discloses the direct, indirect, and cumulative environmental impacts that would result from the Proposed Action and No Action alternatives. The document is organized into six sections:

1. *Introduction*: The section includes information on the history of the project proposal, the purpose and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
2. *Alternatives*: This section provides a description of the agency's Proposed Action alternative as well as other alternatives considered. This section also includes Project Design Features.
3. *Environmental Consequences*: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
4. *Agencies and Persons Consulted*: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
5. *References:* This section lists sources of information used or referred to in the analysis, such as journal articles, books, Forest Service policy documents, etc.
6. *Appendices*: The appendices provide more detailed information to support the proposed action and analyses presented in this EA.

Additional documentation, including more detailed analyses of project-area resources, are included in the project planning record available on the Inyo National Forest website and at the INF Supervisor's Office.

1.2 Background

Non-native invasive terrestrial plant species are among the most significant environmental and economic threats facing our Nation's forest, grassland, and aquatic ecosystems. Invasive plants are defined in Executive Order 13112 as "non-native plants whose introduction does or is likely to cause economic or environmental harm or harm to human health." Invasive plants compromise the ability to manage public lands for a healthy native ecosystem. Invasive plants can create a host of environmental effects that can be harmful to native ecosystem processes, including: displacement of native plants; reduced functionality of habitat and forage for wildlife and livestock; increased potential for soil erosion and reduced water quality; alteration of physical and biological properties of soil; loss of long- term riparian area function; loss of habitat for culturally important plants; high economic cost of controlling noxious and invasive plants; and increased cost of keeping recreational sites free of noxious and invasive plant species (USDA Forest Service (FS), 2013a).

The proposed action is consistent with the 1988 Inyo NF Land and Resource Management Plan (LRMP) and the 1989 Record of Decision (ROD) as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) FSEEIS and ROD (USDA FS 2004) as well as the nearly complete Revised LRMP (USDA FS 2018). The SNFPA ROD directs the Forest Service to undertake invasive plant management and to prioritize activities in the following order: 1) prevent new introductions of invasive species; 2) conduct early treatment of new infestations; and 3) contain or control established infestations (USDA FS 2004, page 36).

The Forest Service Manual 2900 (USDA FS 2011) directs the Forest Service to use an integrated pest management (IPM) approach for invasive species control, to develop and utilize a site-based and species-based prioritization for management of invasive species infestations, and to use a structured decision-making process and adaptive management to help identify and prioritize invasive species management approaches and actions. IPM requires integration of multiple program components- prevention, early detection/rapid response, mapping, control, re-vegetation, and monitoring- with site-specific selection of treatment methods (manual, chemical, biological, and/or cultural) based on factors including effectiveness, feasibility, ecological impact, and safety.

Additional management direction to prevent, control, and eliminate priority infestations of invasive species on National Forest system lands can be found in National and Regional Strategy documents (USDA FS 2013a; USDA FS 2013b; USDA FS 2000).

The Inyo National Forest has existing procedures in place for invasive plant prevention, inventory, and monitoring as part of the IPM approach, as outlined in the Inyo NF Integrated Invasive Plant Management Strategy (2005, revised 2014). Environmental analysis under the National Environmental Policy Act (NEPA) is not required to implement these aspects of the IPM approach; the proposed action and environmental analysis in this document focuses on treatment and restoration activities. In addition, actions approved under other forest projects may include invasive species management objectives, such as prescribed burning, grazing allotment management, or special use permit clauses.

1.3 Purpose and Need

The purpose of this project is to reduce the extent and spread of invasive plant infestations that threaten wildland values in a timely and cost-effective manner, while protecting human health and ecosystem functions. The project would improve the ability to treat existing infestations and rapidly respond to new (currently non-existent or undocumented) invasive plant infestations and species. The project would accomplish the following objectives:

1. Treat infestations discovered since the 2007 Weed Eradication and Control Project (Weed EA; INF 2007) and subsequent to this analysis.
2. Improve treatment effectiveness and feasibility relative to past efforts by providing a broader suite of treatment options.
3. Reduce costs, difficulty, and impacts to forest resources by eradicating new infestations when they are small.

The 2007 Weed EA authorized treatment of 24 invasive plant species at 227 specific locations totaling approximately 2,570 gross infested acres on the Forest, using manual pulling, hand and power tools, and herbicide application by hand (chlorsulfuron, glyphosate, imazapyr, and triclopyr only). In 2010, an additional project was approved for hand application of herbicide (chlorsulfuron and imazapyr only) to newly-discovered infestations of perennial pepperweed at specific locations in the Golden Trout Wilderness. Current and historic funding has resulted in 80-125 acres of invasive plant treatment per year. Herbicide use on the Inyo NF from 2008 to 2016 ranged from 0.2 to 6.3 lbs of active ingredient per year, with a total of 18.4 lbs active ingredient applied from 2008 and 2016 (USDAFS FACTS Database, May 2018).

Treatment is ongoing under both decisions, and has resulted in the successful eradication or control of some infestations, especially at sites with few or single individuals. The most notable successes include eradication of numerous tamarisk infestations on the forest, elimination of a small perennial pepperweed site where herbicide was applied by hand, and reduction in size of several small spotted knapweed infestations that were hand-pulled. However, there is a need for expanded treatment options, because the currently approved methods for herbicide application (hand-painting) can be prohibitively slow and labor-intensive, and have resulted in ineffective treatment of infestations of pepperweed, whitetop, and knapweeds. In addition, newly discovered infestations cannot be treated under the current decisions; notable new finds since 2007 include one small infestation of Canada thistle, and additional infestations of pepperweed, whitetop, and knapweeds.

As a result of surveys conducted for the implementation of the above decisions and other forest projects, over 1,100 additional infestations have been documented since 2007. Currently, 58 non-native invasive plant species are known to occur on the forest, and approximately 45,846 gross infested acres are mapped (Appendix A), with infestations ranging from a single plant to areas over 5,000 acres in size. A means of implementing an Early Detection/Rapid Response (EDRR) approach to treat newly discovered invasive plants is clearly needed. In addition, a broader variety of efficient herbicide treatment methods are necessary to accomplish the goals of eradication or control. For species with rhizomatous root systems or those that re-sprout from cut stumps or root fragments, hand application of herbicide is inefficient when there is a large number of individuals or a very dense infestation. Finally, high-risk invasive plants have been found in designated areas (e.g. Wilderness, Mono Basin Scenic Area); these invasions threaten the resource values which those designations were intended to protect.

Invasive species do not recognize land ownership boundaries and spread indiscriminately between National Forest lands and neighboring ownerships. Effective invasive plant management requires cooperation and coordination between adjacent public land managers (federal, state, county) and private landowners. Currently, invasive plant treatments are being conducted by BLM and NPS, Inyo-Mono County, Caltrans, California State Parks, and LADWP on adjacent lands or ROWs on the INF. In addition, many permittees and licensees on the INF are required to treat invasive plants within their permitted area (e.g. hydroelectric utilities, ski areas, pack-stations, recreation residences, etc). Lack of appropriate and effective treatment by the Forest Service could lead to invasive plant spread not just on NFS lands but onto adjacent private and public lands. There is a need to improve consistency and coordination with the work being done by others to manage invasive plants within the INF administrative boundary and on adjacent lands.

The introduction, establishment, and spread of invasive plant species can occur unpredictably and rapidly.

Many infestations are associated with infrastructure and developments, such as roads, trailheads, or buildings, where vectoring risk from people, vehicles, and equipment is high and disturbance facilitates establishment. Potential growth and spread of infestations can be highly influenced by disturbance, ranging from local road maintenance activities to fires and floods. Asher and Dewey (2005) documented annual rates of spread from 10-24% for many invasive plant species in the western United States. In addition, density of an invasive plant may increase even if the acreage does not change. Flexibility and a wider range of treatment methods are needed to manage the variety of invasive species, adapt to changing climate and environmental conditions and respond rapidly to invasive plant threats that may be currently unknown within the project area.

1.4 Decision Framework

The decision to be made by the Forest Supervisor is:

1. To implement the proposed action or take no action at this time, and
2. Provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or a Finding of No Significant Impact (Forest Service Handbook 1909.15, Ch. 41).

The decision to implement the proposed action would authorize treatment of infestations in wilderness. For infestations located in wilderness areas or RNAs, the Regional Forester is the responsible official who makes the decision whether to approve treatment using herbicides or biocontrol (FSM 2320). Any treatment in wilderness other than manual methods would be reviewed in a site-specific Minimum Requirements Decision Guide (MRDG) and a Pesticide Use Proposal (PUP; for herbicide use) (Project Design Feature #39).

1.5 Public Involvement

This project was listed in the Schedule of Proposed Actions (SOPA) for the Inyo National Forest in January 2016. The Proposed Action was sent out for public comment via a scoping letter on August 16, 2016. In addition to the SOPA and scoping letter, the Proposed Action has been posted on the Inyo National Forest website during and since the scoping period (http://www.fs.usda.gov/inyo/projects).

Nine responses were received during scoping. Responses were used to refine the proposed action and design features, identify significant issues, and focus the environmental analysis. A summary of Forest Service consideration of scoping responses is contained in the project record.

1.5.1 Issues

The Forest Service separates issues into two groups: significant and non-significant issues. Significant issues are defined as directly or indirectly caused by implementing the proposed action. Non-significant issues are identified as: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Code of Federal Regulations (40 CFR Part 1501.7(3)) of the Council on Environmental Quality's (CEQ) NEPA regulations requires the Forest Service to

“Identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review…”

The interdisciplinary team carefully considered scoping comments received from the public, other agencies, and Forest Service personnel, and determined the following issues are relevant to the decision to be made:

1. Concern about adverse impacts from herbicide use to human health and safety, and environmental resources (wildlife, water quality), including specific recommendations on herbicides to be included and changes to design criteria.
2. Concern about herbicide application in wilderness.
3. Concern about treatment prioritization for specific invasive species.

Alternatives to the proposed action developed in response to issues raised during the scoping period are described further in Section 2.3 Alternatives Considered but Eliminated from Detailed Study.

2. Alternatives

2.1 Alternative 1- Proposed Action

The Proposed Action is to annually treat a portion of the invasive plant infestations on the Inyo NF. The number of infestations and acreages treated each year will depend upon available funding. Proposed treatments will follow an Integrated Pest Management (IPM) approach, which combines prevention, control, and restoration measures. Control measures would involve integrated prescriptions that typically combine the use of manual, mechanical, cultural, and chemical methods. Often, several years of treatment are required to eradicate or control an infestation. Each treatment would be subject to modification by Project Design Features, which define the set of conditions or requirements that the proposed activities must meet to avoid or minimize potential effects to resources.

Restoration measures are also an essential component of the proposed IPM approach. Restoration measures may include seeding of native species, planting of potted or bare-root plants, or mulching with certified weed- and weed-seed-free native mulch, plant litter, duff, or straw/wood shred.

Treatments of newly discovered (currently unmapped) infestations or species of invasive plants would occur according to the Early Detection Rapid Response (EDRR) approach, which is designed to allow for control of new invasive plant infestations as soon as possible after their detection. EDRR treatments could occur outside of currently mapped areas and for species currently unknown on the forest, but these treatments would be reviewed during an Annual Implementation Process.

2.1.1 Project Area

This project covers all lands administered by the Inyo NF. Areas proposed for treatment fall into three categories:

1) Currently mapped infestations. A total of 45,846 acres are currently mapped as infested with invasive plants as of early 2018 (Appendix A).
2) Growth of mapped infestations. Where there are limited resources to accomplish treatments, infested areas will generally continue to increase in size, as described in the Purpose & Need

section. The proposed action would allow for treatment of these enlarging infestations, depending on prioritization and resources available.

3) Infestations discovered subsequent to this analysis. The proposed action would allow for treatment of newly discovered (currently unmapped) infestations or species of invasive plants as described under the EDRR section.

While the majority of the Forest and therefore invasive species treatments would be in Mono and Inyo Counties, the Forest also covers portions of Fresno, Madera and Tulare Counties in California, and Esmeralda and Mineral Counties in Nevada.

2.1.2 Treatment Strategy

Infestations would be prioritized for treatment based on the following factors:

- Early invaders with high environmental impacts (per California Department of Food and Agriculture (CDFA) and California Invasive Plants Council (Cal-IPC) ratings) and/or small or few isolated infestations on the forest.
- Infestations in special status areas (e.g. Wilderness, Ancient Bristlecone Pine Forest, sage grouse or other special status species habitat) and associated points of access.
- Infestations with a high potential for future spread **-** prolific species found in high traffic areas such as administrative or recreation sites, trailheads, major access points for the forest, and systems vulnerable to invasion (recent fires or fuelbreaks).
- Leading edge or satellite occurrences of larger more established infestations.

Infestations or species that do not fit into the above categories may be targeted for treatment if resources become available, but would generally be a lower priority.

For each known or newly discovered invasive plant infestation, one of four treatment strategies would be implemented (see Appendix A):

1. Eradicate: Annually treat and monitor the infestation with the goal of complete elimination of the species (58 acres; e.g. knapweeds, perennial pepperweed).
2. Control: Treat and monitor a portion of the infestations each year, focusing on reducing the acreage and percent cover over time (1,431 acres; e.g. tamarisk).
3. Contain: Treat leading edge or new satellite infestations, or where concurrent with high-value resources (40,175 acres; e.g. Russian thistle, cheatgrass, black locust).
4. Limited/No treatment: Limited to site-specific restoration projects or no treatment efforts at this time (4,180 acres; e.g. woolly mullein, dandelion).

The treatment strategy assigned to a particular species or infestation may change over time given the feasibility or availability of treatment methods covered in this project. It is anticipated that the vast majority of the treatments conducted under this project will be for Priority 1 and 2 invasive plant species.

2.1.3 Treatment Methods

The proposed Integrated Pest Management (IPM) control approach will employ a combination of treatment methods. Successful treatments often require multiple years of treatment, and sometimes require multiple treatments per year, in part due to funding and resource constraints, but also due to biological factors (e.g. presence of a seed bank, resprouting). Treatments are tailored depending on the biology of the target invasive plant species, population size and density, site type, and prior treatment effectiveness. Complete eradications typically require annual treatment over 3-5 years or longer to ensure there is no regrowth or new seed germination. Treatments aimed at reducing numbers or preventing further spread may occur on a less frequent but ongoing schedule. Design features described in Section 2.1.6 would be implemented during all invasive plant treatments.

Assuming a treatment method meets design features and is effective, practical, and cost-efficient, treatment methods would be selected in the following order of preference:

1. Manual and mechanical methods such as hand pulling and cutting
2. Cultural methods, including tarping, flaming, and light wands, which manipulate environmental conditions to suppress invasive plants and encourage desirable species
3. Herbicide application (chemical methods)
4. Biological control (biocontrol) methods

Non-chemical methods are typically considered feasible when populations are smaller than a few hundred plants in size, and/or when woody species are still small enough to be hand-pulled, although many factors, such as the age of the plants and number of people available to participate in the control effort are also factors. Some biennial and perennial species, either those with deep or rhizomatous roots, or those that re-sprout or regrow from root fragments, can only be effectively controlled with herbicide.

See Appendix A for a list of known invasive plant species on the Inyo NF and anticipated treatment strategy and methods.

2.1.3.1 Manual and Mechanical Methods

1. Manual removal, including hand-pulling or digging using hand tools such as shovels or hoes. This can be effective for small populations, especially for annual plants. It can be effective for the seedlings of perennials, shrubs, or trees, but usually not for mature established woody plants. For deep-rooted plants, hand tools such as a weed wrench or hoe may be used.
2. Cutting of woody species can be effective in the short-term, but often requires subsequent treatment of resprouting stems with herbicide to be effective. Hand saws may be used, and chainsaws may be used by certified personnel.
3. Mowing before seed set may be used to control annuals or other types of invasive plants and as a preliminary treatment to remove some biomass prior to another treatment, such as pulling, hoeing, or herbicide application. To avoid soil disturbance that encourages invasive plant growth, equipment would either be hand-held (e.g. string-trimmer) or have minimal tread, and the operator would use steering patterns that avoid rutting.
4. Clipping may be used to remove seed heads and/or fruiting bodies to prevent seed dispersal and may be used to avoid soil disturbance. When flowers or fruits are removed, they must be bagged and disposed of in a landfill to prevent seed spread.

2.1.3.2 Cultural Methods

1. Tarping or solarization involves covering the infested area with a barrier, usually plastic, to raise soil temperature and block light. Mulch may be used to smother or shade out invasive plants.

These methods can be effective for controlling small populations, especially in locations such as borrow pits or closed roads, where native vegetation is not yet established.

2. Flaming using a hand-held propane torch raises the leaf temperature to the point of bursting cells and does not require igniting vegetation. This method is applied prior to seeds becoming viable in the late winter or early spring when fire danger is low. Fire personnel would be on site for the use of this method, to provide for human safety and to ensure there is no potential for fire spread from the treated area. This method would only be considered for herbaceous species.
3. Exposing a plant to high levels of blue light using a hand-held light wand (e.g. NatureZap or similar) or mounted light system disables the photosynthesis pathway causing the plant to die.

2.1.3.3 Chemical Methods

Eight herbicides are proposed for use (Table 1), with species-specific targets displayed in Appendix A. All herbicides proposed are registered for use in California and Nevada and would be applied according to label directions and project design features, using ground-based methods to terrestrial systems only. Proposed herbicide application methods include:

1. <u>Hand Application:</u> Herbicide application is conducted by a hand-held applicator and no spraying occurs, thereby limiting the likelihood of drift. For example, these methods are typically used for control of large woody species such as tamarisk and Russian olive (a and b) or for certain infestations of pepperweed, whitetop or Canada thistle that grow close to water (c).
    a. <u>Cut-Stump</u>: The trunk or branches are cut through and the stump is immediately painted with herbicide. Herbicide may also be “daubed” directly on the cut surface using a sponge wand or dripped using squeeze bottles. Follow up treatment of re-sprouting stems is typically necessary on a proportion of the plants treated.
    b. <u>Hack and Squirt</u>: Herbicide is applied directly to living tissue in woody species by partially cutting or drilling into a trunk or branch and painting, dripping, or injecting herbicide on exposed cambium. This method may be used when cutting stems is not possible or when it may be desirable to leave standing dead vegetation in place.
    c. <u>Wick/Wipe/Drip</u>: Herbicide is applied by hand to foliage of individual plants with a brush or sponge, or dripped with a squeeze bottle. This method is primarily used for control of small infestations or portions of infestations where spray application is restricted (such as close to water or special status species).
2. <u>Directed Foliar/Basal Bark Spray/Drizzle</u>: Herbicide is applied to green foliage of individual plants or the lower portion of the trunk of woody species (basal bark) with backpack sprayers or hose sprayers attached to a mounted tank. This method uses a hand-operated spray wand with a regulator nozzle to control application of herbicide to target plants while minimizing spray between target plants. For example, this method may be used to treat infestations of knapweeds and pepperweeds, as well as tamarisk re-sprouts, or woody species such as tamarisk and Russian olive (basal bark).
3. <u>Spot Spray</u>: Herbicide with residual soil activity (aminopyralid or clopyralid only) is applied to the target invasive plant and adjacent soil using a sprayer wand to provide pre-emergent control of re-sprouts and seedlings. This method would be limited to sites with high percent cover of invasive plants and requires incorporation by rainfall to reach the root zone of the target species. For example, this method may be used to treat certain knapweed infestations.

4. Broadcast Foliar Spray: Herbicide is applied using a boom sprayer that is either hand-held or mounted on an ATV or vehicle. This method is only used for dense infestations where invasive plant cover is very high and risks to other resources are minimal (e.g. dense road-side infestation of knapweed with high cover). No broadcast application of chlorsulfuron, imazapyr, or triclopyr.

The most common herbicide method for mature woody species is likely to be the cut stump treatment, while the most common method for herbaceous species and seedlings of woody species is likely to be directed foliar application. The herbicide selected will be the one with the highest probability of meeting the management objectives of eradication or control while minimizing soil persistence and potential for leaching, restrictions for use in grazing areas, risk of affecting non-target species, and risk to applicator safety. Tank mixtures may be used if permitted by the label and when existing written recommendations are available from State Agriculture Departments or other official resources such as Universities and County Cooperative Extensions.

The Pacific Southwest Regional Policy for Pesticide Use Management and Coordination (USDA Forest Service, 2014) includes the following policies for pesticide use in California:

1. Only use pesticides registered by both the state of California and the U.S. Environmental Protection Agency, and adjuvants registered by the state of California.
2. Follow all federal and state of California pesticide-related laws and regulations and USFS policies in planning and implementing pesticide application.
3. Pesticide-use training and certification is required for Forest Service employees who use, or directly supervise the use of pesticides on Forest Service lands within California will be accomplished through California's pesticide applicator certification program.

Each herbicide prescription proposed for use will be submitted to the Forest Supervisor in a Pesticide Use Proposal form for approval (PUP; FS-2100-2; FSM 2150) and will be reviewed annually. Proposed uses and implemented applications will be submitted to the respective County.

2.1.3.3.1 Adjuvants

Most herbicide applications are more effective when combined with adjuvants (solution additives), such as surfactants and marker dye. Surfactants enhance activity of an herbicide's active ingredient by facilitating and enhancing the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of the herbicide. Marker dyes are used to visually confirm the location of the herbicide application; this assists the applicator in limiting the application to the target plants.

This project will use a methylated seed oil (MSO) type surfactant, such as Hasten and Competitor. This type of surfactant is being used due to the favorable environmental profile. No petroleum or petrochemical-based surfactants would be used. No POEA surfactants (the surfactant found in the commercial glyphosate formula RoundUp) would be used. A water-soluble dye, such as Highlight Blue or Colorfast Purple, would be used.

Table 1. Herbicides proposed for invasive plant treatments, including herbicide characteristics and application considerations. Additional information available from Tu et al. (2001) and DiTomaso et al. (2013).

Herbicide (Active Ingredient)	Example Trade Name	Mechanism	Selectivity	Biological timing of application	Seasonal or temperature restrictions	Soil persistence (avg. soil half-life in days)	Potential for leaching	Use permitted near water?[1]	Use permitted in grazed areas?[2]
Aminopyralid	**Milestone**	Growth regulator (auxin mimic)	Broadleaf species, particularly Asteraceae and Fabaceae	Pre- and post-emergence; For annuals, seedling stage; for perennials, when plants are fully expanded	Product should be >40°F to prevent crystalizing	35	Limited, but may leach into ground water if there are permeable soils and water table is shallow	Do not apply directly to water	Yes
Chlorsulfuron	**Telar**	Inhibits synthesis of certain amino acids	Broad spectrum, best on broadleaf	Pre- and post-emergence; Bud to bloom or fall rosette stage	None	28-42	Low as herbicide readily adsorbed to soil	Do not apply directly to water	Yes (maximum application rate applies)
Clethodim	**SelectMax**	Inhibits fatty acid synthesis	Annual and perennial grasses	Post-emergence; For annuals, seedling stage; for perennials, when plants are fully expanded	Do not apply to plants stressed by extreme high or low temperatures	3	Very low	Do not apply directly to water	Yes (delay in entry)
Clopyralid	**Transline**	Growth regulator (auxin mimic)	Broadleaf species, particularly Asteraceae and Fabaceae	Pre- and post-emergence; For annuals, seedling stage; for perennials, when plants are fully expanded	None; may require higher application rates during extreme temperatures	12-70, average 40	Moderate, particularly with shallow water tables	Do not apply directly to water	Yes
Fluazifop-P-Butyl	**Fusilade DX**	Inhibits fatty acid synthesis	Annual and perennial grasses	Post-emergence; For annuals, seedling stage; for perennials, when plants are fully expanded	Not effective in drought conditions	15	Very low	Do not apply directly to water	Yes (delay in entry)

Herbicide (Active Ingredient)	**Example Trade Name**	**Mechanism**	**Selectivity**	**Biological timing of application**	**Seasonal or temperature restrictions**	**Soil persistence (avg. soil half-life in days)**	**Potential for leaching**	**Use permitted near water?[1]**	**Use permitted in grazed areas?[2]**
Glyphosate	**Rodeo**	Inhibits synthesis of amino acids	Broad spectrum	Post-emergence; Rapidly growing plants	None	47, but no soil activity	Very low as herbicide has high adsorptive capacity	Can be applied in and around aquatic sites and wetlands	Yes
Imazapyr	**Arsenal, Stalker**	Inhibits synthesis of amino acids	Broad spectrum	Pre- and post-emergence; Rapidly growing plants	Late summer or fall; oils may assist in uptake during stress	25-142, depending on soil type	Low potential for leaching, but is susceptible to surface runoff, and leaching from dead roots may occur	Can be applied in and around aquatic sites	Yes (foliar treatment cannot exceed 10% of grazed area)
Triclopyr	**Garlon 3A, Garlon 4**	Growth regulator (auxin mimic)	Broadleaf and woody species	Post-emergence; Rapidly growing plants.	Potential for volatility increases with ambient temperature for ester formulation (Garlon 4)	30 (10-46)	Not considered to have high potential for ground or surface water contamination	TEA-Can be applied in aquatic sites BEE-Do not apply directly to water	Yes (foliar treatment cannot exceed 10% of grazed area)

[1] Per herbicide label directions. Labels do not specify distance in feet to water. Project specific herbicide buffers will be implemented (Table 3).

[2] Per herbicide label direction. Restrictions can vary from application rate restrictions to timing requirements, and may include delays of grazing following herbicide application.

2.1.3.4 Biological Control Agents

Biological control agents are available for some of the invasive species known on the Inyo NF (Table 2). This method involves release of natural enemies such as parasitoids, predatory insects, pathogens, or antagonists to suppress pest populations. This method generally does not eradicate invasive plant populations, but may cause stress or reduction in numbers; in addition it takes substantial coordination with other agencies. Therefore, use of biocontrol agents would likely be less common than the other methods proposed. The US Department of Agriculture, Agricultural Plant Health and Insect Services (APHIS) is the lead agency for biocontrol activities in the US, and is required to complete NEPA analysis and documentation before allowing the use of a specific biological control agent. In addition, organisms must be approved by the state agricultural department prior to their release. Prior to being permitted, biocontrol organisms must undergo considerable testing and meet strict criteria to ensure they pose no threat to non-target species. Use of this method would comply with the APHIS NEPA document and decision, would be conducted in coordination with the appropriate federal, state, and/or county agencies, and would be reviewed during the project Annual Implementation Process.

No biological control agents have previously been released on the Forest, though some organisms released on adjacent lands may have dispersed to Forest lands (e.g. Chinese leaf beetle for tamarisk control on Los Angeles Department of Water and Power lands in the Owens Valley; release of puncturevine weevil by Inyo County in 2014).

Table 2. Currently available biological control agents for invasive species known to occur on the Inyo NF (CA Department of Food & Agriculture, Pest Detection & Emergency Projects Branch, January 2018; NV Department of Agriculture, January 2018).

Invasive species	Biological Agent	Common Name	CA	NV
Acroptilon repens (Russian knapweed)	*Jaapiella ivannikovi*	Russian knapweed galling midge	x	x
	Puccinia acroptili	leaf and stem rust fungus		x
Bromus spp. (cheatgrass, red brome)	*Pseudomonas fluorescens* (ACK55)	Bacterium	x	
Centaurea diffusa (diffuse knapweed)	*Agapeta zoegana*	yellow-winged knapweed root moth		x
	Bangasternus fausti	broad-nosed seed head weevil	x	x
	Chaetorellia acrolophi	knapweed peacock fly		x
	Cyphocleonus achates	knapweed root weevil		x
	Larinus minutus	lesser knapweed flower weevil	x	x
	Larinus obtusus	blunt knapweed flower weevil		x
	Sphenoptera jugoslavica	knapweed root-boring beetle	x	x
	Subanguina picridus	stem-gall nematode		x
	Urophora affinis	banded knapweed seed head gall fly	x	x

Invasive species	Biological Agent	Common Name	CA	NV
	Urophora quadrifasciata	four-banded knapweed seed head gall fly	x	x
Centaurea stoebe (spotted knapweed)	*Agapeta zoegana*	yellow-winged knapweed root moth	x	x
	Chaetorellia acrolophi	knapweed peacock fly		x
	Cyphocleonus achates	knapweed root weevil	x	x
	Larinus minutus	lesser knapweed flower weevil	x	x
	Larinus obtusus	blunt knapweed flower weevil		x
	Sphenoptera jugoslavica	knapweed root-boring beetle		x
	Terellia virens	green clearwing fly	x	x
	Urophora affinis	banded knapweed seed head gall fly	x	x
	Urophora quadrifasciata	four-banded knapweed seed head gall fly	x	x
Cirsium arvense (Canada thistle)	*Hadroplontus litura*	Canada thistle stem mining weevil		x
	Puccinia punctiformis	rust fungus		x
	Urophora cardui	Canada thistle stem gall fly		x
Cirsium vulgare (bull thistle)	*Cheilosia corydon*	shoot stem and root boring fly		x
	Urophora stylata	bull thistle seed head gall fly	x	
Linaria dalmatica (dalmation toadflax) *Linaria vulgaris* (butter and eggs)	*Calophasia lunula*	toadflax moth		x
	Mecinus janthiniformis	dalmation toadflax stem weevil	x	x
	Rhinusa antirrhini	toadflax seedhead weevil		x
Salsola tragus (Russian thistle)	*Coleophora klimeschiella*	Russian thistle casebearer	x	
	Coleophora parthenica	Russian thistle stem-mining moth	x	
Tamarix ramosissima (tamarisk)	*Diorhabda carinulata*	northern tamarisk beetle	x	
	Diorhabda elongata	Mediterranean tamarisk beetle	x	
Tribulus terrestris (puncturevine)	*Microlarinus lareynii*	puncturevine seed weevil	x	x
	Microlarinus lypriformis	puncturevine stem weevil	x	

2.1.4 Revegetation

Revegetation of gaps in vegetation or bare areas created by invasive plant treatments is a critical component of an integrated invasive plant management strategy. In some cases, re-colonization from the existing seedbank and propagules may be sufficient; in other situations active restoration may be needed to provide competition with highly aggressive species. Revegetation of bare areas created by invasive plant treatments, particularly with perennial grass species, may suppress re-growth of invasive species.

Site restoration and revegetation may be helpful in preventing re-infestation by the invasive plant that has been treated, or a new infestation by another invasive species. Revegetation will be implemented by spreading native seed, or by planting native plants, either as bare root stock or potted plants. Non-native species would not be used. Revegetation may include mulching with native litter or duff, or certified weed-free straw, raking to establish the seed bed, and treatment of invasive plants, as required, using the methods proposed above.

2.1.5 Monitoring

The Forest will continue to inventory invasive plant infestations and monitor treatment efficacy and will use this information to evaluate and direct eradication and control activities. Treatment effectiveness will be monitored each year using standard procedures described in the National Data Recording Protocols for Invasive Species Management, using the form shown in Appendix B. These protocols record data on the location of treatments and the percentage of the targeted invasive species population (infestation) that was controlled by the treatment. The effectiveness of each treatment would be evaluated by reviewing efficacy ratings and adjusting methods (within the parameters of the Project Decision) to improve effectiveness. For example, annual monitoring may show a need to adjust treatment timing to increase efficacy or to revise use of a particular method. Monitoring would typically continue at treated sites for at least three years with no plants found prior to determining the target species has been eradicated.

2.1.6 Early Detection Rapid Response

The Early Detection Rapid Response (EDRR) approach is an essential component of the Invasive Plant Management Strategy and, coupled with prevention guidelines and an annually-updated inventory, will allow the Inyo NF to maintain a greater portion of the forest in an invasive plant-free condition. Under the EDRR approach, new or previously undiscovered species or infestations would be treated using the range of methods described in this Proposed Action and in accordance with the Project Design Features. EDRR is a necessary component of the Forest's treatment program because 1) the precise location of individual target plants, including those mapped in the current inventory, can change over time; and 2) new introductions and detection of previously unknown infestations will continue in the future.

The intent of the EDRR approach is to treat new infestations when they are small so that less time and resources are required for treatment, and the ecological impact is minimized to the extent possible. This approach assumes that new infestations will be similar to current infestations and will occur within the same variety of conditions, therefore treatment effects are expected to be reasonably predictable. The precise location of the treatment may be unpredictable; however, Project Design Features, intended to minimize or eliminate adverse effects that could occur, would address the broad range of circumstances under which EDRR treatments are likely to occur. EDRR treatments would be reviewed each year following the Annual Implementation Process or occasionally during the field season (following the same review process) if a high-priority infestation requiring immediate treatment is detected.

2.1.7 Annual Implementation Process

Annual treatments would be implemented using the Annual Implementation Process described below. This process, led by the Forest Invasive Species Coordinator, would allow resource specialists to review planned treatment methods and maps of the specific sites proposed for treatment each year, including all newly identified infestations (EDRR) and expansions of existing infestations. The Annual Implementation Process would ensure that effects are within the scope of those disclosed in the project analysis; if new proposed treatment sites would result in effects or conditions not analyzed or addressed in the project environmental analysis, those treatments would be deferred to a future NEPA analysis.

The Annual Implementation Process would include a review and documentation of proposed site-specific treatment methods and applicable project Design Features for implementation. This process integrates the strategies outlined in this EA and also satisfies pesticide use planning requirements in the Forest Service Handbook (FSH 2109.14). The following process would be followed:

1. Update Invasive Plant Database (NRIS). Findings of annual inventories and surveys, including population information and mapping, are updated in the corporate database by botany staff. (Fall/Winter)
2. Develop annual treatment plan. Treatment areas and methods would be proposed by the Forest Invasive Species Coordinator. This step would identify the preferred method(s) of treatment and an initial list of applicable Project Design Features specific to each infestation. (Winter/Spring)
3. Review of annual treatment plan. The treatment plan would be submitted to the Interdisciplinary Review Team consisting of resource specialists addressing heritage resources, hydrology, soils, botany, terrestrial and aquatic wildlife, range, and recreation resources. The submitted plan would include 1) a spreadsheet detailing site information, treatment method(s), known resource concerns, and applicable design criteria, and 2) a GIS layer of sites proposed for treatment. The team would confirm that all applicable design features are identified for each site, and would identify any changes to the proposed treatments that are needed to ensure that the effects of the proposed treatments would be within the range of those analyzed in the selected alternative. (Winter/Spring)
4. Coordination and notification. Notifications via Forest social media, or individual notifications of tribes, adjacent landowners, or permit holders as appropriate, occur to ensure awareness of upcoming invasive plant treatments. (Spring)
5. Treatment and Post-Treatment Monitoring and Adaptive Management. Treatments are implemented following all applicable design features identified for each site. Effectiveness of treatment and Project Design Features would be monitored as described in the Monitoring section (2.1.5) and the Project Design Features section (2.1.8). Adjustments to treatment methods would be proposed during the following Annual Implementation Process. (Spring/Summer/Fall)

2.1.8 Project Design Features

Project Design Features (DFs) define a set of conditions or requirements that an activity must meet to avoid or minimize potential effects on sensitive resources and to ensure consistency with the Forest Land Management Plan. DFs involving herbicides are an added layer of caution to the already regulated and approved use of these chemicals. DFs are not optional and application of these measures is the basis for the effects analysis for this project.

The Project DFs are based on site-specific resource conditions within the project area, including but not limited to the current invasive plant inventory, the presence of sensitive species and their habitats, proximity to water and potential for herbicide delivery to water, and the social environment. Recommended Best Management Practices from Cal-IPC (2012) were considered in the development of DFs. DFs listed are not an exhaustive list of all relevant Forest Plan Standards and Guidelines or pesticide label directions. However, project implementation will be consistent with all Forest Plan direction and will follow all herbicide label instructions. Where multiple design features apply (e.g. presence of listed amphibians and aquatic features at a site), the most restrictive design feature will be implemented in order to adequately protect all resources present.

Standard Treatment Procedures

1. Herbicides will be applied by trained and/or certified applicators in accordance with label directions and applicable federal and state pesticide laws, except where the following design features describe more restrictive measures.

2. Weather conditions (wind speed and direction, probability of precipitation, temperature, temperature inversions, atmospheric stability, and humidity) will be carefully monitored before and during herbicide applications to minimize drift, volatilization, and leaching or surface runoff of herbicides, based on label instructions.

3. Prior to the start of spray applications, all spray equipment will be calibrated to ensure accuracy of delivered amounts of herbicide. Equipment will be regularly inspected during herbicide applications to ensure it is in proper working order.

4. Herbicide spray applications will not occur when wind speeds exceed label restrictions. Use best professional judgment and consider application-specific factors (e.g. pesticide and adjuvant properties; application equipment, height, pattern and technique; target vegetation density, size, and acreage; proximity to sensitive resources; temperature and humidity; and wind speed and direction) to ensure spray applications do not result in unacceptable drift. Prior to beginning spray applications, applicators will be provided with information on local terrain and wind patterns and how they affect spray drift.

5. Herbicide application will be carefully evaluated following precipitation and/or when runoff, soil saturation, standing water, or heavy dew is present or expected, to ensure the application will not result in herbicides entering surface or groundwater. Application will occur only under favorable weather conditions, generally defined as: 30% or less chance of precipitation on the day of application based upon NOAA forecasting, rain does not appear likely at the time of application, and if rain is predicted within 48 hours, the amount does not exceed a ¼ inch.

6. Preparation of herbicides for application, including mixing, filling of wands and rinsing of equipment, will take place outside of Riparian Conservation Areas and other sensitive sites (300 ft from perennial waters, 150ft from intermittent streams, and 25 ft from ephemeral). Herbicide preparation will occur only on level, disturbed sites.

7. A spill cleanup kit will be readily available whenever herbicides are transported or stored. Proper Personal Protective Equipment (PPE) would be worn or carried by the applicator at all times when using herbicides.

8. Streams or other surface waters will not be used for directly washing herbicide application equipment or personnel, unless required in an emergency situation.

9. Low nozzle pressure (<25 PSI) and a coarse spray producing median droplet diameter of >500 microns will be used in order to minimize drift during herbicide applications.

10. The herbicide spray nozzle will be kept as close as possible (within 20 inches) to target vegetation to limit overspray and drift to non-target vegetation.

11. When invasive plants are manually removed, methods that prevent seed spread or resprouting will be used. If flowers or seeds are present, the plant will be pulled carefully to prevent seeds from falling and will be placed in an appropriate container for disposal. If no flowers or seed heads are present the invasive plant may be pulled and placed on the ground to dry out.

12. Equipment, vehicles, clothing, and personal items will be inspected and cleaned as necessary to ensure they are free of soil, seeds, vegetative matter or other debris prior to entering new treatment areas or moving from one infestation to another.

Recreation and Public Land Uses

13. The public will be notified about upcoming herbicide treatments via Forest social media, individual notifications, or posting signs, as applicable. Cautionary signs will be placed at treatment areas and access points prior to initiating treatment when infestations are located near developed/established recreation sites or other high visitation areas. Signs will list herbicides used, target species, application date, and name and phone number of Forest contact.

14. Treatments at special use sites, developed recreation sites, and areas of concentrated public use will be scheduled to avoid weekends and holidays and high use periods of the day. Permittees or Recreation Managers will be notified prior to treatments so that treatments can be scheduled to minimize conflicts.

15. Tribes will be notified of proposed herbicide treatments during the Annual Implementation Process to ensure that plant gathering areas and other sensitive sites are protected. Areas of concern will either be avoided or appropriate treatment measures will be developed in consultation with the tribes.

Heritage

16. The Forest Archaeologist will be consulted during the Annual Implementation Process to ensure specific proposed treatments are implemented in a manner to avoid effects to historic properties.

Terrestrial and Aquatic Wildlife

Federally Threatened or Endangered Amphibians (Sierra Nevada yellow-legged frog (SNYLF), northern (DPS) Mountain Yellow-Legged Frog (MYLF) and Yosemite Toad (YT))

17. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within SNYLF, MYLF or YT designated critical habitat or within 500 feet of known occurrences. Treatment strategies in these areas, including applying buffers, limited operating periods, and relocating individual amphibians, will be developed collaboratively on an annual basis by the Noxious Weed Coordinator and the Forest Fisheries Biologist to ensure treatment efforts minimize or avoid impacts to frog and toad populations and critical habitat.

In occupied habitat the following restrictions apply:

20. Immediately prior to any treatment activities, a Forest Service biologist who is trained in identifying and handling rare amphibians will survey the area for SNYLF, MYLF and YT. If individuals are found they will be relocated to a safe location that is nearby but out of potential harm's way from treatment activities. In most cases this will be less than 100 feet from the original location of the amphibian.

21. Chemical treatments within 50 feet of active breeding locations for SNYLF, MYLF and YT would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA at all times for SNYLF and MYLF, and until after metamorphosis for YT. Metamorphosis of YT typically occurs around July 31st and will be confirmed with a site-specific survey prior to treatment.

Federally Threatened or Endangered Fish (Lahontan and Paiute cutthroat trout (LCT and PCT) and Owen's tui chub)

23. During the Annual Implementation Process, the Forest Fisheries Biologist will review treatment sites that are within 300 feet of occupied LCT, PCT, and Owen's tui chub streams, to ensure treatments follow design features outlined below.

24. Chemical treatments within 50 feet of LCT, PCT, and Owen's tui chub occupied habitat would be limited to direct foliar, spot spray, or hand application of glyphosate, imazapyr, or triclopyr-TEA.

Federally Threatened or Endangered Terrestrial Wildlife – Sierra Nevada bighorn sheep (SNBS)

25. Within SNBS critical habitat that contain PCEs: manual treatment is the preferred method and herbicide application would be limited to direct foliar or hand application.

26. To minimize disturbance to SNBS, treatments will not be conducted in known occupied lambing habitat during the lambing period, which typically occurs between April and mid-July.

Terrestrial Wildlife – Other

27. Invasive plant treatments will be avoided in sage-grouse habitat during the breeding (March 1 – May 1) and nesting (May 1 – June 15) seasons (INF Sage-Grouse Interim Management Policy, 2012). Site-specific exceptions may be allowed if reviewed and approved by the Forest or District Wildlife Biologist.

Botany

28. During the Annual Implementation Process, the Forest Botanist will review treatment sites that are within 500 feet of TES plant occurrences. The treatment method(s) shall be designed to avoid impacts to TES plants. Herbicide spray applications would not occur within 100 feet of TES plants for broadcast application or within 50 feet for direct foliar/spot application. Modifications may be made by the Forest Botanist; selectiveness of herbicide, timing of application, protective barriers, etc. could be used to reduce the risk of herbicide effects on adjacent sensitive plants.

29. Where treatments occur within or directly adjacent to TES plant occurrences, a Botanist will instruct workers in the proper identification of TES plant species to ensure that individual plants are avoided/protected.

30. Where determined necessary based on habitat suitability, surveys will be conducted for TES plant species in the vicinity of treatment areas prior to treatment.

31. If treatments occur within and adjacent to TES plant occurrences, the forest will implement monitoring designed to detect positive and negative impacts to TES plant occurrences. These results will be reported for the TES plant occurrence in the appropriate national database (e.g. NRIS) and utilized to adapt prescriptions during future treatments.

Soil and Water

32. Herbicide application will not occur within the buffers for aquatic features shown in Table 3.

33. Areas of bare soil created by the treatment of invasive plants will be evaluated for restoration and revegetation by a Botanist and Soil Scientist or Watershed Specialist. Restoration measures, such as native plantings, seeding, or application of weed-free ground cover, will be implemented as needed.

34. State and Regional Water Quality Control Board certified Best Management Practices will be implemented (Appendix C). BMPs applied to all Forest projects are outlined in the Water Quality Management for Forest System Lands in California, BMP handbook and the National Core BMP Technical Guide (USDA Forest Service, 2012).

35. Mixing or application of herbicides will not occur within 100 feet of a well or spring used as a domestic water source. Applicators will be briefed about the locations of domestic water sources prior to beginning work and buffers will be flagged on the ground.

36. During the Annual Implementation Process, the Forest Watershed Specialist will review the treatment sites to determine if they occur on soils with low permeability and/or high water table. Broadcast and spot spray of aminopyralid and clopyralid would not occur in these areas.

37. Hand pulling or wrenching of invasive plants along streambanks or natural lake or pond shorelines will not exceed 20 percent of the stream reach or 20 percent of the shoreline.

Range

38. The Forest rangeland specialist will be notified annually of the proposed treatment schedule. Grazing permittees will be provided with treatment information (location, schedule and labels) each grazing season as part of Annual Operating Instructions for Grazing Permits.

Wilderness and Research Natural Areas

39. Manual removal of invasive plants will occur within designated or recommended Wilderness areas and RNAs whenever possible. If it is determined that manual treatments will not be effective, an MRDG will be completed and Regional Forester approval is required for any herbicide use or biological control within a Wilderness Area (FSM 2320) or RNA (FSM 2150.44).

40. District wilderness staff will be notified annually of proposed treatments in Wilderness areas.

41. Non-manual methods would be proposed to treat an invasive species within Wilderness only when:
    a. The invasive species poses ecosystem-level threats to Wilderness:

i. The invasive species would displace native vegetation to the extent the species would alter natural plant communities and soils, which would affect wildlife habitat and biological diversity.
ii. The invasive species has the potential to rapidly spread throughout an ecosystem to infest a Wilderness at the landscape scale.
iii. The invasive species would alter ecological processes or disturbance processes such as fire.

b. Use of these methods would prevent the need for larger, more intensive control methods in the future that would further manipulate the biophysical environment.
c. There are no treatment options outside the Wilderness boundary (FS 2324.04b).
d. Or the invasive species is a threat to resources outside of Wilderness (FSM 2323.26b).

Table 3. Minimum buffers (ft)[1] for herbicide application near aquatic features.

	Live Water Present[2]			**No Live Water Present[3]**			**Dry Wash/ Ephemeral[4]**
Herbicide (Active Ingredient)	**Broadcast Spray**	**Direct Foliar/ Spot Spray[5]**	**Hand Application**	**Broadcast Spray**	**Direct Foliar/ Spot Spray[5]**	**Hand Application**	**Direct Foliar/ Hand Application**
Aminopyralid	50	25	10	50	10	10	channel edge
Chlorsulfuron	N/A	25	water's edge	N/A	25	channel edge	no buffer
Clethodim	50	25	10	50	25	10	no buffer
Clopyralid	50	50	10	50	25	10	channel edge
Fluazifop-P-Butyl	50	25	10	25	25	10	no buffer
Glyphosate*	25	water's edge	water's edge	25	channel edge	channel edge	no buffer
Imazapyr*	N/A	25	water's edge	N/A	10	channel edge	no buffer
Triclopyr-TEA*	N/A	25	water's edge	N/A	10	channel edge	no buffer
Triclopyr-BEE	N/A	25	10	N/A	10	10	no buffer

[1] Buffers are assumed to be relatively level vegetated areas.
[2] Perennial and intermittent streams with water present, ponds, lakes, springs, seeps, seasonal wetlands, and wet meadows.
[3] Seasonally flowing or intermittent channels that support riparian-dependent vegetation but no water is currently present; dry seasonal wetlands and meadows.
[4] Dry washes and ephemeral channels that do not support riparian-dependent vegetation.
[5] Spot spray (pre-emergent treatment) will only occur with aminopyralid or clopyralid.
* Aquatic formulation would be used within 25 feet of live water.

2.2 Alternative 2- No Action

The No Action alternative serves as a baseline for comparison of the effects of the action alternative(s). Under this alternative there would be no change to the level and types of activities currently being implemented for the control or eradication of invasive plant infestations on the Inyo NF. Invasive plant treatments allowed under existing NEPA decisions would continue to occur but no new or additional efforts would be implemented.

The forest is currently treating invasive plants under three previous decisions. The 2007 Weed Eradication and Control Project (Weed EA; INF 2007) authorized treatment of 24 invasive plant species at 227 specific locations totaling approximately 2,570 gross infested acres on the Forest, using manual pulling, hand and power tools, and herbicide application by hand. In 2010, an additional project was approved for hand application of herbicide to newly-discovered infestations of perennial pepperweed at a few specific locations in the Golden Trout Wilderness. The 2017 Bassia Control on Mono Lake project authorized hand removal and prescribed burning to control invasive species on Mono Lake islands.

2.3 Alternatives Considered but Eliminated from Detailed Study

No Herbicides

Some scoping comments suggested that herbicide use should be eliminated. This alternative was previously analyzed as Alternative 3 of the 2007 Weed Eradication and Control project. This alternative would not meet the purpose and need of the project for two reasons: 1) certain invasive plant species or infestations cannot be effectively treated or eradicated with methods other than herbicide, and 2) manual or mechanical methods cannot keep pace with the potential growth of larger infestations.

No Glyphosate

One scoping comment requested inclusion of an alternative that did not use the herbicide glyphosate for invasive plant treatment. This alternative was not fully analyzed because the best available science does not indicate that any environmental effects would be measurably different than the proposed action if glyphosate was not included. Glyphosate is an effective herbicide for the treatment of many high-priority species and is an important tool because it can be applied close to water, has formulations which are low-toxicity to aquatic organisms, and has low toxicity to human health when applied in accordance with the label directions and proposed project actions.

Alternative Substances to Registered Herbicides

Some scoping comments suggested that alternatives to registered herbicides be considered such as those made from natural ingredients (e.g. citrus and thymol oil extracts). These approaches were investigated but have not been demonstrated to be effective on deep rooted or rhizomatous perennials, especially established mature individuals and grass weeds. They can be expensive, have no residual activity, and are non-selective. In addition, application rates and directions are not regulated, so potential effects to non-target species are not quantifiable, and ecotoxicity and human health data is typically not available (Wilen 2012, Kashkooli & Saharkhiz 2014, Arslan & Uremis 2015, Smith-Fiola & Gill 2017). This alternative was also previously considered but eliminated from detailed study in the 2007 Weed Eradication and Control project.

3. Environmental Consequences

This section describes the environmental impacts of the proposed action (Alternative 1) and no action (Alternative 2) in relation to whether there may be significant environmental effects as described at 40 CFR 1508.27. This analysis is organized by resource area. The following specialist reports, which are held in the project record, are incorporated by reference:

- Biological Evaluation for R5 Forest Service Sensitive Plant Species (Engelhardt 2018a)
- Biological Evaluation for R5 Forest Service Sensitive Animal Species (Schlick 2019a)
- Biological Assessment for Federally Designated Threatened and Endangered Species and their Designated Critical Habitat (Schlick 2019b)
- Consultation for Screened Undertaking-Cultural Resources Report R2018050402254 (Beidl 2018)
- Invasive Plants Risk Assessment (Engelhardt 2018b)
- Water Quality Assessment (Ellsworth 2018a)
- Soil Specialist Report (Ellsworth 2018b)
- Human Health and Safety Report (Engelhardt 2018c)

3.1 Botany & Vegetation

The following botany and vegetation analysis is summarized from the Plants BE. This section summarizes effects to sensitive species, by describing the number of known occurrences in the vicinity of high-priority infestations, the likelihood that the majority of an occurrence would be impacted by invasive plant treatment, and whether the project would lead to a trend toward federal listing for any sensitive plant species.

There are 67 plant species on the Inyo NF Sensitive Species List, 56 of which have confirmed occurrences on the forest and 11 of which have suitable habitat but no confirmed occurrences. Currently, six sensitive plant species with seven occurrences are located within 500 feet of known high-priority infestations (Priority 1 & 2) for treatment (Table 4). These species include annual herbs (*Phacelia inyoensis* and *Phacelia monoensis*), perennial herbs (*Boechera shockleyi*, *Calochortus excavatus*, and *Erigeron multiceps*), and a tree (*Pinus albicaulis*). All of these species have multiple occurrences on the INF, with the exception of *E. multiceps*, which only occurs at one 3-acre population on the INF. In addition, all these species have occurrences outside the INF.

Table 4. Known sensitive plants in the vicinity (<500 ft) of high priority infestations and likely proposed treatment methods.

Species	Common Name	Site ID	Location	Infestation	Distance (ft)	Proposed Treatment
Boechera shockleyi	Shockley's rockcress	BOSH-008	Sam's Spring	tamarisk (TARA-004)	0	Cut-stump in 2008, 2009, 2011, 2014, 2015; follow-up survey for re-sprouts and additional plants, possible additional cut-stump
Calochortus excavatus	Inyo County star-tulip	CAEX-001	McMurry Meadow	teasel (DIFU-001)	430	Hand pull and/or direct foliar
Calochortus excavatus	Inyo County star-tulip	CAEX-002	Fuller Creek	teasel (DIFU-001)	10	Hand pull and/or direct foliar
Erigeron multiceps	Kern River daisy	ERMU-001	South Fork Kern River	tamarisk (TARA-050)	0	Hand-pulled in 2015; follow-up survey for additional plants, possible additional hand-pull or cut-stump

Species	Common Name	Site ID	Location	Infestation	Distance (ft)	Proposed Treatment
Phacelia inyoensis	Inyo phacelia	PHIN-005	McMurry Meadow	teasel (DIFU-001) whitetop (CAPU-005)	DIFU-175 CAPU-10	Teasel-Hand pull and/or direct foliar; Whitetop-direct foliar
Phacelia monoensis	Mono County phacelia	PHMO-011	Queen Valley	saltlover (HAGL-025)	175	Hand pull and/or direct foliar
Pinus albicaulis	Whitebark pine	PIAL-018	Onion Valley	pepperweed (LELA-008)	225	Direct foliar and/or wipe

3.1.1 Alternative 1

Many invasive plants compete with sensitive species and can reduce their abundance. Invasive plants can also indirectly affect sensitive species by degrading their habitat through the alteration of fire or nutrient regimes. Biodiversity of native plant communities is reduced by invasive species that form dense monocultures. Once invasive species become established they can be difficult to eradicate, requiring time and resources, often over multiple years, for successful treatment. While invasive plant treatment could cause some negative impacts to individual sensitive plants in the short-term, this project is expected to have beneficial effects on sensitive plants, their habitat, and native vegetation in the long-term as the impacts from the persistence and spread of invasive plants is controlled.

3.1.1.1 Direct & Indirect Effects

Manual and mechanical methods for removing invasive species can be effective and are highly selective but there is a small risk of workers inadvertently trampling, uprooting, or otherwise disturbing non-target vegetation including sensitive species growing intermixed with invasive species. If a significant amount of invasive plant vegetative material is left on site (such as piled tamarisk cuttings), non-target vegetation or sensitive plants could also be buried or shaded by it. When using a string trimmer or mower there is some risk of impacting non-target vegetation intermixed with the target invasive species. Incidental trampling is also a possibility during implementation of cultural and herbicide treatment methods as workers move through the treatment area. However, the direct effects of these methods would be restricted to the area of treatment and the immediate surrounding area that may experience foot or equipment traffic during implementation.

To minimize impacts to sensitive species, treatments will include design features #29-32 (Section 2.1.8). These design features would minimize or remove the risk of direct effects to sensitive species from manual and mechanical treatments.

Hand-pulling is likely to be used to treat infestations or portions thereof in the vicinity of sensitive plant occurrences BOSH-008, CAEX-001, CAEX-002, ERMU-001, PHIN-005, and PHMO-11 (Table 4), in order to minimize potential direct effects from less selective treatment methods. There is some potential for impacts to individuals from incidental trampling, however workers will be instructed in plant identification, and the target invasive species are easily identifiable and differ in appearance compared to the sensitive plant species. Therefore it is expected that negative effects, if any, will be minimal, short-term, and limited to a few individuals.

Cultural treatments such as tarping, mulching and flaming may cause localized effects to non-target native vegetation that is inter-mixed with invasive species, because these methods cannot be restricted solely to the target invasive plants. However, the direct effect would be precisely restricted to the footprint in which these methods were applied. These treatments would not be widely used, and therefore will not affect a high number of sensitive plants. It is unlikely that these methods would be used in areas with high cover of sensitive species, which would minimize the potential for direct effects (DF #29, 31).

Currently there are no infestations in the vicinity of known sensitive plant sites where any cultural treatment method is proposed.

Herbicide Application

Direct exposure*:* While all herbicide applications have some risk of direct exposure to surrounding non-target vegetation (generally within about five feet), the proposed action has been designed to reduce effects to non-target vegetation by always favoring the most selective/targeted treatment available that is effective and feasible. Broadcast or spot applications would only be selected when vegetation cover is dominated by invasive species. Selective application methods (direct foliar, cut-stump, and wiping/dripping) would be the method used for the majority of infestations identified for herbicide treatment, so widespread effects to non-target vegetation from direct exposure are not expected under the proposed action.

For sensitive species, spray applications would be avoided within 100 or 50 feet of sensitive plant populations (DF #29). This would effectively negate the chance of any accidental direct spray or over spray. Under EDRR the Forest Botanist would design treatments to effectively remove invasive species without adversely impacting the sensitive plant occurrences and to also ensure that sites are properly protected (i.e. flagged on the ground) when invasive plant treatments are conducted (DF #29, 30, 31). Additional techniques, such as timing application after annuals are senesced or prior to perennials emerging, using protective barriers, or using selective herbicides, can also be used to minimize potential for direct impacts to sensitive and non-target plant species.

Off-target drift*:* When using spray application methods (boom and backpack) there is some potential for effects from herbicide drift down-wind of the application area. These effects can range from reduced plant vigor, abnormal growth, or necrosis to death, depending on both the exposure (dose) and the herbicide-sensitivity of the affected plant species. Herbicide drift is influenced by a number of factors including site topography and surrounding vegetation; spray droplet size; wind speed and direction; and height of spray nozzle. Project design features have been included for all herbicide spray applications to reduce the potential of off-target drift including Design Features #4, 9, 10 and 33 (Section 2.1.8). With implementation of these design features, we expect the effects of off-target drift to be none, or limited to a few individuals or a small portion of the occurrence at the edge closest to the invasive plant infestation.

For analysis of off-target drift effects to sensitive species, we reviewed the SERA risk characterization models (SERA 2007 and 2011) and results of Forest Service specific applications (Marer 2000) for each herbicide to provide an estimate of the maximum projected risk to non-target plant species. We used the SERA risk models to evaluate the effects of buffers of 50 and 100 feet for broadcast application and direct foliar/spot application, respectively. These distances were chosen as the distance where most herbicides would have no or limited drift impact but would still allow for effective treatment of invasive plant species. Based on direct experience from herbicide applications on NFS lands, the inclusion of design features to limit drift (Marer 2000) (e.g. course droplet size, wind restrictions, low nozzle height), and implementation of 100 feet and 50 feet herbicide-spray exclusion zone, the risk to Sensitive plants from herbicide drift is expected to be low. Buffers created around aquatic features such as meadows, fens, and along riparian corridors will also serve to protect riparian vegetation and sensitive species habitat within riparian zones.

Other Off-target movement (wind erosion, runoff, leaching)*:* Off-target effects from herbicides are primarily a concern for chemicals that remain active in the soil (i.e. herbicide with pre-emergent properties) such as aminopyralid, clopyralid, chlorsulfuron, and imazapyr. Off-target effects could occur from wind erosion moving contaminated soil, water moving across a treated area into an untreated area, or herbicides moving in the soil. Potential for off-target movement is greatest for spot applications, where herbicide is applied directly to the soil, as well as for broadcast application, where there is potential for bare soil areas within the treatment swath. Targeted herbicide applications (directed foliar, wicking and wiping, and drizzle) are expected to have limited risk of movement from runoff since herbicides are not applied directly to the soil, and label directions (e.g. spray to wet only) and design criteria (DF #1, 2, 3, 5) have been included to minimize the amount of herbicide that would potentially contact soil.

Review of SERA Risk Assessment exposure scenarios and risk characterizations for proposed herbicides indicate that hazard quotients are below the threshold of concern for the majority of potential off-target exposure scenarios. An exception is potential runoff from low permeability soils (e.g. clay) with aminopyralid and clopyralid, which would be addressed by project design features restricting broadcast and spot applications on low permeability soils (DF #37). The proposed action also prohibits broadcast spray with chlorsulfuron, imazapyr, and triclopyr. These design features will limit off-target movement of herbicides and associated effects to adjacent sensitive plants.

Known Sensitive Plants: There are seven known occurrences of sensitive plants within 500 feet of infestations proposed for herbicide application (Table 4). Two occurrences (BOSH-008 and ERMU-001) are near tamarisk infestations, which would be treated by the cut-stump method. In this situation, the greatest risk would be from trampling, since there is no risk of over-spray or spray drift with this application method. Three occurrences (CAEX-001, PHMO-011, and PIAL-018) are greater than 175 feet from infestations proposed for direct foliar spray, so there is little risk from direct exposure or spray drift. Two occurrences (CAEX-002 and PHIN-005) are relatively close (~10 feet) from infestations proposed for direct foliar spray. Portions of the infestation which fall within the 50 foot no-spray buffer around sensitive plants would likely be hand-pulled, or a barrier or other strategy used to protect rare plants during application. If there are undiscovered individuals or populations of sensitive plants within the vicinity of herbicide applications, there would be potential for impacts from herbicide application, which could range from reduced plant vigor, abnormal growth, or necrosis to death of individuals.

Early Detection Rapid Response*:* Under Early Detection Rapid Response (EDRR), herbicide treatments at new infestations may occur near sensitive plant species if other control methods are likely to be ineffective and impacts to sensitive plants can be avoided by buffers, herbicide selection, application timing, etc. In the event that future control efforts include herbicide application near sensitive plants, the botanist would work closely with applicators to avoid affects from off-target (drift, runoff, leaching) and direct exposure (DF #29, 30, 31). Possible methods to limit effects from drift could include the use of alternative application methods that do not produce driftable fines associated with spray application such as wicking, wiping, drizzle; timing selective application methods so threatened and sensitive plants are not likely to be affected by drift; using a spray cone; covering sensitive plants during herbicide applications; scheduling spray applications when prevailing winds are blowing away from sensitive plant habitat; or flagging and avoiding occurrences. In addition, if herbicides are sprayed within 500 feet of sensitive plants, post-treatment monitoring would be conducted to ensure that the assumption that herbicide application would not adversely affect sensitive plant occurrences is correct.

Biological control could result in consumption of sensitive plant tissue or use of plants for larval development by biocontrol insects or affects from pathogens. However, any effects are expected to be minor given that the insects and pathogens approved for biocontrol programs are selective and extensive research is conducted prior to their approval to ensure there is a low risk of affecting non-target native species. This method would not be proposed in a situation where there was a potentially high risk of extensive impacts to sensitive plant species (DF #29). The associated reduction in the number and cover of invasive species with this method is expected to benefit sensitive plant species in the long-term, by reducing competition for resources and preserving native plant diversity.

Revegetation of treated invasive plant infestations is expected to have indirect beneficial effects on sensitive plants and their habitats in the short to long-term as a result of reducing the likelihood of re-invasion and the risk of soil erosion. Revegetation would primarily occur in areas that are highly-disturbed and lacking sufficient native vegetation for passive restoration, conditions which are unlikely to support sensitive plant species initially. There is a slight risk that individual sensitive plants could be trampled by workers or equipment during revegetation, but these effects are expected to be limited in occurrence and short-term. In the long-term, revegetation is expected to enhance habitat conditions for sensitive and other native plant species, by providing competition with invasive species and re-establishing native species composition and cover.

3.1.1.2 Cumulative Effects

Current inventories of sensitive plant species capture the aggregate impact of past human actions and natural events that have led to the current distribution of these species on the Inyo NF (CEQ 2005). Ongoing forest management activities would have similar effects to analyzed species as the proposed project, since all projects are surveyed and/or reviewed to similar standards as the proposed project or would be prior to treatment implementation, if infestations occur in suitable habitat for sensitive species. In addition, future projects would incorporate similar design features to avoid impacts to known occurrences of sensitive plant species, unless the project is intended to restore or enhance the species or its habitat and potential impacts are expected to be minor. There is always the chance that some individuals of some sensitive plant occurrences may be adversely affected by proposed project activities, especially if there are undiscovered individuals or populations. However, these impacts are not expected to be so great in intensity or duration that any of the known occurrences would be eliminated, even when combined with other ongoing Forest activities and projects. As with ongoing actions, future actions on NFS lands would be surveyed to similar standards and mitigations developed to ensure that any impacts to Sensitive plant species are either beneficial or mitigated so that the long-term viability of each Sensitive plant species on the forest is maintained.

The implementation of the proposed action may result in some minor, short-term potential adverse direct and indirect effects from trampling or herbicide drift, but also will provide longer-term beneficial effects to sensitive plant habitat and native vegetation communities from control and eradication of invasive plant species. Because the majority of the known occurrences of sensitive plant species on the forest are greater than 500 ft. from current high priority treatment areas, no direct effects to these occurrences are currently anticipated. There is, however, the potential that surveys around new infestations prioritized for treatment in subsequent years may detect new sensitive plant occurrences in the vicinity of proposed treatment areas. Direct and indirect effects to new occurrences under EDRR treatments are expected to be comparable to those described above.

For the six sensitive species that are currently known to occur within 500 feet of high priority treatment sites (Table 3), these specific occurrences do not constitute the entirety of their distribution on the INF (except for *Erigeron multiceps*). For all species, there are also additional occurrences on adjacent land ownerships. Although project effects would add cumulatively to the effects of past, ongoing and future actions for sensitive species on the forest, these effects are not expected to lead to a loss of viability or trend toward federal listing for any sensitive species on the Inyo NF.

3.1.2 Alternative 2

3.1.2.1 Direct and Indirect Effects

With implementation of the No Action Alternative, treatment methods and locations would be limited to those approved under previous NEPA decisions (manual removal and hand applying herbicide with limited herbicides at sites known as of 2007). Currently, six sensitive plant species with seven occurrences are located within 500 feet of known high-priority infestations (Priority 1 & 2) (Table 4). The infestations near these rare plant sites would all be more effectively controlled with new methods available in this project. In addition, six out of the seven infestations were discovered subsequent to the 2007 EA and thus are not authorized for treatment under that project. Under the No Action alternative, these infestations could not be treated and would continue to degrade sensitive plant habitat. In addition, infestations of high priority species would continue to threaten habitat conditions and ecosystem health, particularly in meadows and riparian areas, as well as along roads, trails, and wilderness areas. Existing infestations would be expected to increase in spatial extent and density over time. As a result, invasive species would increasingly affect native ecosystems, as well as Sensitive species. Native plant diversity and wildlife habitat quality would be reduced over time due to increasing dominance by invasive species.

3.1.2.2 Cumulative Effects

Vectors would continue to spread invasive species throughout the project area, and additional infestations would be detected adjacent to sensitive plant occurrences. With limited control methods and no opportunity to treat new infestations, there could be long-term cumulative effects to sensitive plant species occurrences on the Inyo NF via competition and habitat degradation.

3.2 Invasive Plants

At present, the majority of the Inyo NF is relatively free of high-priority invasive plants. High priority-species (see Appendix A), only total 1,489 acres across the forest, equivalent to ~0.08% of the land base.

Most invasive plant infestations are associated with disturbance or vectors such as roads, trails, and riparian corridors.

3.2.1 Alternative 1

3.2.1.1 Direct and Indirect Effects

Under the Proposed Action a portion of infested acres of invasive plants would be treated annually using a variety of methods. Treatments would utilize an IPM approach on currently documented infestations or new infestations found over the life of the project, following the prioritization scheme described in Section 2.1.2 of the Proposed Action. As a result, with implementation of the Proposed Action, small isolated infestations are expected to be eradicated and an initial reduction in size would be expected for the larger infestations with eventual control and/or eradication within the life of the document. New sites, expanded sites, and new species discovered within the project area would be treated under this alternative using methods outlined in the Proposed Action. One to several repeat treatments would likely be necessary at many sites because species may re-sprout from rhizomes or stumps, or when established infestations have built up an on-site seed bank that may take several years to deplete. The annual implementation review process would ensure resources are protected and appropriate project Design Criteria are implemented at all existing and new treatment areas, and efficacy monitoring would be conducted on a regular basis to ensure treatment methods are successful in controlling infestations (Section 2.1.5).

Generally, manual control methods such as hand-pulling, digging, wrenching, or cutting, are most effective for control of annual species and tap-rooted herbaceous plants; they are much less effective against invasive plant species with deep underground stems and roots, which have the ability to resprout following treatment (Tu et al. 2001). Herbicide treatments would be used to control larger infestations of herbaceous species and those species with creeping rootstalks in conjunction with appropriate manual or cultural treatments where needed throughout the project area. Many times herbicide treatments are considered to be the most economic and effective method of invasive plant species control (DiTomaso et al. 2013). However, their effectiveness is highly dependent upon the biology of the target species, herbicide formulation, application method, and site-specific variables such as climatic and environmental conditions (Bossard et al. 2000).

Implementation of the Proposed Action is expected to result in eventual eradication of the known sites of Priority 1 invasive species, and significant reduction in the extent of Priority 2 invasive species. Some control or eradication of select infestations of Priority 3 and 4 species is also likely to occur, but this is expected to be much more limited in extent. Many of these species are likely to continue to expand their footprint on the forest due to their ubiquitous nature, prolific seed production, and unavailable treatment method at the landscape scale (e.g. cheatgrass). These species are primarily addressed through prevention measures to reduce spread, or minimizing conditions which facilitate their expansion.

A potential effect of repeated invasive plant treatment is the development of herbicide resistant biotypes from repeated use of similar herbicides (DiTomaso et al 2013). While a concern, the proposed action is based on the principles of integrated pest management (IPM) and includes a variety of available methods to control and eradicate invasive species on the Forest. According to DiTomaso et al (2013) IPM is one of the most effective methods to minimize the development of herbicide resistant biotypes. In addition, multiple herbicides have been included as potential tools to control most of the invasive species considered for treatment on the INF. This would allow the forest to vary herbicide formulation used if repeated treatments are required for a targeted infestation. Additionally, manual treatments will be utilized whenever effective and practical. During the annual implementation process the forest would revisit prescriptions for all infestations that require additional treatments. This process would allow for adaptive management, shifting ongoing treatments towards non-chemical IPM methods whenever a given infestation has reached a stage where such methods become effective and feasible.

Overall, the invasive plant treatments proposed are expected to be effective in eradicating and controlling high priority species. With limited resources and a lack of available treatment options for those species that occur over such a large extent of the forest (e.g. Russian thistle, cheatgrass), the proposed action is expected to be successful in controlling these species only in limited situations where they occur as isolated infestations or concurrent with another high-priority resources to warrant their treatment. Extensive design criteria and the annual review of all proposed treatments would greatly reduce the risk of inadvertent impacts to other resources in the area as well as human health and safety. Weed workers can be a high risk vector for transport of invasive plant propagules due to their deliberate presence within infestations and subsequent movement across the forest. However, design criteria have been included to ensure that the project does not contribute to the further spread of invasive species within the project area (DF #11, 12). In addition the project would generally occur in areas of the forest vulnerable to invasive species invasion and would sometimes create localized areas of open canopy or bare soil where new invasive species could become established. Design features limiting the extent of bare soil and allowing active restoration when appropriate would further reduce the risk of project activities spreading invasive species (DF # 34, 38).

3.2.1.2 Cumulative Effects

The cumulative effects analysis area for invasive plants is the Inyo NF. Vectors, including vehicles, equipment, people, water, wind, roads and wildlife, as well as projects and activities with the potential for ground disturbance such as vegetation management, wildfires and prescribed burning, grazing, mining, road maintenance, and hydroelectric and recreation infrastructure development, are ongoing and would continue to be present within the project area. These factors have contributed in the past, and continue to contribute currently to the establishment of invasive species within the project area. All ongoing and future projects have project-specific design criteria included as part of the proposed action to minimize the risk that invasive species are introduced or spread by project implementation activities.

Ongoing or future vegetation management and invasive species treatment activities on adjacent public and private lands may have cumulative effects on the distribution of invasive species within the project area, and likely have contributed to the spread of invasive species in the past. Currently, invasive plant treatments are being conducted by BLM and NPS, Inyo-Mono County, Caltrans, California State Parks, and LADWP on adjacent lands or right-of-ways on the INF. Implementation of the proposed action is expected to contribute to beneficial cumulative effects, by improving consistency and coordination with the work being done by others to manage invasive plants within the INF administrative boundary and on adjacent lands. If new infestations are discovered spreading into the project from adjacent lands, this project has been designed to allow rapid treatment of these new infestations while small, potentially leading to their eradication from INF lands with less time and resources needed.

3.2.2 Alternative 2

3.2.2.1 Direct and Indirect Effects

With implementation of the No Action Alternative, treatment methods would be limited to those approved under previous NEPA decisions (manual removal and hand applying herbicide with limited herbicides). In addition, there would be no mechanism to treat any newly discovered infestations, including those discovered in the past 10 years (since the 2007 Invasive Plants EA). The Inyo NF would continue to conduct limited treatment by the available methods, but some high priority species would likely not be treated. Many of these species are high priorities for treatment and eradication by other entities in California (CDFA, Cal-IPC, and local Weed Management Areas) as well as adjacent land managers and owners. Alternative 2 would not enhance opportunities for collaboration with stakeholders and cooperators.

Without the implementation of the Proposed Action, infestations would continue to spread and increase, eventually becoming well established and potentially impossible to eradicate without intensive and expensive treatments. Seeds would continue to be transported and infest new sites throughout the area particularly within riparian areas and adjacent meadow habitats, and also along roads and trails, and existing infestations would be expected to increase in spatial extent and density over time. As a result, invasive species would increasingly affect native ecosystems, as well as Sensitive species. Native plant diversity and wildlife habitat quality would be reduced over time due to increasing dominance by invasive species. Wilderness values would be impacted as known infestations spread and degrade native ecosystems. Far fewer infestations or invasive species would be eradicated or controlled under this alternative.

Invasive plant prevention measures would continue to be incorporated into new projects as design criteria and would serve as a critical means of limiting spread of existing infestations and introductions of new invaders. Another likely outcome of selecting Alternative 2 is that invasive plant treatment actions (including herbicide application) would be proposed project by project, which could lead to redundancy and inefficiency in environmental analyses, inconsistency between treatment methods across the forest, and greater time and costs for both project planning and invasive plant program management.

3.2.2.2 Cumulative Effects

The scope of analysis and the effects of past, ongoing and future foreseeable actions under the No Action Alternative would be identical to those discussed for Alternative 1. Vectors would continue to spread invasive species throughout the project area, and design criteria would continue to be incorporated into proposed projects. Invasive species infestations; however, would be treated on a more limited basis and the impacts associated with expanding infestation would compound over time.

3.3 Wildlife

Effects to wildlife are discussed in two sections below. Section 3.3.1 addresses effects to Federally Listed species, including Federally designated threatened, endangered, and proposed species, and their critical habitat. This section contains a summary of the information included in the Biological Assessment (BA) for this project (Schlick 2019a). The draft BA has been submitted to the U.S. Fish and Wildlife Service (USFWS) and consultation is underway between the agencies. Based on comments from the USFWS, the BA may be edited and a final will be completed before a decision is signed on this project.

Section 3.3.2 summarizes effects to animal species listed as sensitive by the Regional Forester of the Pacific Southwest Region of the US Forest Service. This section is summarized from the effects analysis included in the Biological Evaluation (BE) for this project (Schlick 2019b).

3.3.1 Federally Listed Wildlife Species

A list of species and designated or proposed critical habitats considered for the biological assessment was obtained from the USFWS Information for Planning and Consultation (IPaC) website (https://ecos.fws.gov/ipac/) on March 27, 2018. This species list is equivalent to the recent consultation (November 5, 2017) for the Inyo NF Forest Plan Revision involving the Carlsbad Fish and Wildlife Office, the Reno Fish and Wildlife Office, and the Sacramento Fish and Wildlife. Species listed in Table 5 below were determined to be known to occur in the Inyo NF or have habitat within the Inyo NF and could be affected by Inyo NF actions; therefore these are the species carried forward and analyzed in detail in this project's biological assessment (Table). No other listed species are known to occur in the Inyo NF, nor do they have proposed or designated critical habitat within the Inyo NF and are therefore not affected by the proposed action and are not analyzed in the biological assessment.

Table 5. Federally Designated Threatened, Endangered, Proposed, and Candidate Species Analyzed for the Forestwide Invasive Plant Treatment Project

Common Name[1]	Scientific Name	Status[2]
Sierra Nevada bighorn sheep	*Ovis canadensis sierrae*	Endangered
Mountain yellow-legged frog, northern DPS	*Rana muscosa*	Endangered
Sierra Nevada yellow-legged frog	*Rana sierrae*	Endangered
Yosemite toad	*Anaxyrus canorus*	Threatened
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	Threatened
Paiute cutthroat trout	*Oncorhynchus clarkii seleniris*	Threatened
Owens tui chub	*Gila bicolor snyderi*	Endangered

Table identifies final designated critical habitat for listed species that occurs within the Inyo NF.

Table 6 Designated Critical Habitat Analyzed for the Forestwide Invasive Plant Treatment Project

Species	Critical Habitat Status
Sierra Nevada bighorn sheep	Final Designated critical habitat
Mountain yellow-legged frog, northern DPS	Final Designated critical habitat

[1] DPS = Distinct Population Segment
[2] E = Endangered; T = Threatened; C = Candidate

Sierra Nevada yellow-legged frog	Final Designated critical habitat
Yosemite toad	Final Designated critical habitat

One species has had recent petition decisions that found that listing under the Endangered Species Act was not warranted: Bi-State population of greater sage-grouse (*Centrocercus urophasianus*) (United States Department of the Interior 2015b). Consultation on these species is not required under the ESA or other agency policy. This species is a Forest Service Sensitive species for the Inyo NF and conservation approaches, plan direction, and consequences are addressed in the biological evaluation (USDA, 2018).

The indicator for federally listed wildlife species is whether the project will adversely affect individuals or designated critical habitat.

3.3.1.1 Alternative 1

<u>Mountain yellow legged frog, northern DPS and Sierra Nevada yellow-legged frog and Critical Habitat</u>
Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by invasive plant treatment activities, implementation of the proposed action ***may affect, likely to adversely affect*** the northern distinct population segment of the mountain yellow-legged frog and Sierra Nevada yellow-legged frog.

Although most Sierra Nevada yellow-legged frog critical habitat occurs in wilderness and this limits herbicide treatment options for weeds and the potential for weed infestations, a small portion of habitat occurs outside of designated wilderness. Because weed management could occur in critical habitat overall, any negative effects to primary constituent elements from treatment methods will be minor and short term and will not adversely modify habitat conditions for the frogs we determine that adoption of the Proposed Action ***may affect, likely to adversely affect designated critical habitat*** for the Sierra Nevada yellow-legged frog on the Inyo National Forest.

All of the critical habitat for the northern DPS of the mountain yellow-legged frog occurs in wilderness and this limits our ground disturbing management actions. However, overall, any negative effects to primary constitute elements from treatment methods will be minor and short term and will not adversely modify habitat conditions for the frogs we determine that adoption of the Proposed Action ***may affect, likely to adversely affect designated critical habitat*** for the northern DPS of the mountain yellow-legged frog on the Inyo National Forest.

These determinations are based on the following findings:

- There are portions of six yellow-legged frog, northern (DPS) mountain yellow-legged frog critical habitat subunits covering approximately 97,046 acres occur on the Inyo NF and the three known weed site accounts for 0.2%.
- Sierra Nevada yellow-legged frog and mountain yellow-legged frog are primarily within wilderness boundaries are limited and there are few high-priority invasive plants currently known therefore treatments in suitable habitat are expected to be limited in scope and scale. Furthermore wilderness areas tend to have small potential for noxious weed populations to occur in frog habitat due to few vectors and extensive disturbance, and environmental conditions that are not conducive to many invasive species life cycle.

- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- Given the limited amount of currently known acreage within critical habitat and proposed treatment priorities and strategies (BA [Schlick, 2019a] Appendix D), as well as the limited vectors, resilient habitat, and high-elevation environmental conditions (lead to low likelihood of future introductions), we expect future levels of infestations to be similar (low) but remains unknown into the future.
- The potential for beneficial effects by improving species composition and biodiversity of flora to the ecosystem would contribute to the primary constituent elements related to aquatic and terrestrial habitat by reducing infestations of noxious weeds into these habitats.
- Almost all critical habitat occurs within designated wilderness which limits many ground-disturbing activities that could adversely affect habitat. The following Project Design Features for Federally Threatened or Endangered Amphibians (Sierra Nevada yellow-legged frog (SNYLF), northern (DPS) Mountain Yellow-Legged Frog (MYLF) and Yosemite Toad (YT)) will apply:
- Design features #17, 20 and 21 restrict certain treatments within SNYLF, MYLF, and YT habitat, require review of treatments on an annual basis by a fisheries biologist, and require surveys at occupied sites immediately before implementation. These design features will add another layer of protection and will minimize adverse effects to federally listed amphibians.

Yosemite Toad and Critical Habitat

The Yosemite toad was listed as a threatened species in 2014 (United States Department of the Interior 2014b). Final critical habitat was designated in 2016 to include approximately 1,812,164 acres in Alpine, Amador, Calaveras, El Dorado, Fresno, Inyo, Lassen, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tulare, and Tuolumne Counties, California. (United States Department of the Interior 2016a). Of the 16 critical habitat units, five are located on the Inyo NF, covering approximately 83,939 acres.

Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by weed activities, adoption of the Proposed Action ***may affect, likely to adversely affect*** the Yosemite toad.

The potential risk of invasive plant infestations to critical habitat occurs primarily in the small portion of critical habitat located outside of designated wilderness around high recreation destinations such as Lake Mary. Overall, any negative effects to critical habitat from treatment methods will be minor and short term and will not adversely modify habitat conditions for the Yosemite toad. In the long-term, actions to control non-native plants would benefit critical habitat for Yosemite toad by allowing native vegetation to recover and reducing the potential for future infestations to occur.

Given the limited amount of currently known acreage within critical habitat and proposed treatment priorities and strategies (Appendix A), as well as the limited vectors, resilient habitat, and high-elevation environmental conditions (lead to low likelihood of future introductions) we expect future levels of infestations to be similar, but remains unknown into the future therefore impacts to PCE are possible. Therefore we determine that adoption of the Proposed Action ***may affect, likely to adversely affect designated critical habitat*** of the Yosemite toad on the Inyo National Forest.

This project is not expected to combine with other past, present and reasonably foreseeable future actions to create significant cumulative effects. Most of the critical habitat for Yosemite toad on the Inyo National Forest occurs within designated wilderness. Past actions, such as fish stocking, have led to a decline in Yosemite Toad populations. Invasive plant treatment will not add to that cumulative effect, because it will have an overall beneficial effect to toad habitat, and because adverse effects to the species and its habitat will be minimized or avoided.

These determinations are based on the following findings:

- Of the 16 Yosemite toad critical habitat units, five are located on the Inyo NF, covering approximately 83,939 acres of which 0.002% account for 2 known weed locations total acreage (1.37 ac). Containing and or treating each site would account for *0.003% of CHU #5 and 0.004% of CHU 13 total area.*
- Relocation of individuals to a safe location away from treatment activities would be considered harassment.
- Tarping may be utilized as a treatment method and could incidentally trap a burrowing toad.
- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- Design features #17, 20 and 21 restrict certain treatments within SNYLF, MYLF, and YT habitat, require review of treatments on an annual basis by a fisheries biologist, and require surveys at occupied sites immediately before implementation. These design features will add another layer of protection and will minimize adverse effects to federally listed amphibians.

<u>Lahontan and Paiute cutthroat trout (LCT and PCT) and Owen’s tui chub</u>
Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by future restoration activities, adoption of the Proposed Action ***may affect, and is not likely to adversely affect*** the Lahontan cutthroat trout, Paiute cutthroat trout, and Owen’s tui chub.

This project will not create significant cumulative effects to listed fish species. There are no known or foreseeable non-federal actions that would affect habitats or individuals other than continued monitoring and management of Paiute cutthroat trout by the CDFW in support of Recovery Action 4. Given this, we do not anticipate a significant increase in the level of impacts to these species' population in the plan area beyond what has already been noted in the analysis of effects resulting from implementing the Proposed Action.

These determinations are based on the following findings (summarized from the BA):

- Weed treatment occurring within known locations where water is expected, would be limited to direction of application following herbicide label that has been approved by the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) or Nevada Department of Agriculture (NDA) for use.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.
- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- Design features #23 and 24 restrict certain treatments within LCT, PCT, and Owen's tui chub habitat, and require review of treatments on an annual basis by a fisheries biologist. These design features, along with general design features to limit undesirable effects of treatments, will add another layer of protection and will prevent adverse effects to federally listed fish species.

Sierra Nevada Bighorn Sheep and Critical Habitat

Based on our analysis, we determined that because some actions and activities may disturb and displace individuals and habitat could be affected by weed restoration activities, adoption of the Proposed Action ***may affect, and is not likely to adversely affect*** the Sierra Nevada bighorn sheep.

Because almost all critical habitat occurs in wilderness or inventoried roadless areas and this limits management actions, we determined that adoption of the Proposed Action ***may affect and is not likely to adversely affect designated critical habitats*** on the Inyo National Forest. This determination is further based on the limited ground disturbing activities proposed in critical habitat, the project design features associated with the Proposed Action, and the long term beneficial effects that will result from controlling and eradicating noxious weeds within critical habitat for Sierra Nevada bighorn sheep.

These determinations are based on the following findings (summarized from the BA):

- Where infestations occur, some disturbance to Sierra Nevada bighorn sheep may occur during manual and herbicide weed treatments. However, the disturbance will be minor, short term and will avoid the critical lambing period. The weight of evidence from available herbicide studies suggest that no adverse effects to mammals are plausible using typical or worst-case exposure assumptions at application rates proposed in this project. Herbicides selected for this project will be applied using a direct application method to individual noxious weeds which adds another layer of protection that would greatly limit exposure to Sierra Nevada bighorn sheep.
- Less than 1% Critical Habitat on Inyo NF is known to contain noxious weeds.
- Risk assessments show levels of exposure considerably below the level of concern for all species groups and all herbicides being considered in this project.

- The forest plan provides components to ensure proposed actions avoid, mitigate or minimize impacts to threatened and endangered species.
- Design features #25 and 26 restrict certain treatments within Sierra Nevada bighorn critical habitat, and prohibit treatments within occupied lambing habitat during the lambing period. These design features, along with general design features to limit undesirable effects of treatments, will add another layer of protection and will prevent adverse effects to this species.

Under the proposed action cumulative effects to SNBS will be minimal and ultimately beneficial. As mentioned earlier, disease transmission from domestic sheep or goats is considered to be one of the greatest threats to bighorn sheep. Disease transmission can kill large numbers of bighorn sheep with devastating consequences, particularly for smaller, isolated herds. Implementation of this Invasive Plants project will not add any increased risk of SNBS sheep coming into contact with domestic sheep or goats. There is some potential for human disturbance associated with treatment efforts to cumulatively affect SNBS because in some locations they are already subject to disturbance from human recreation. However, because the potential for noxious weeds to occur in SNBS sheep is considered low, the need for weed treatments and thus potential human disturbance is expected to be minimal, and a design feature would limit human presence in the vicinity of lambing habitat during the critical time period.

3.3.1.2 Alternative 2

Under the No Action Alternative, no new activities are proposed and therefore there would be no direct effects to any listed species.

If the No Action alternative is selected, there could be indirect effects due to a greater expansion of invasive plant species across the Forest. Infestations would be expected to slowly increase in spatial extent and density, and these infestations could be the seed source resulting in new infestations within the project area. Over time, expansion could result in a reduction in native plant species and healthy, native plant communities in the affected areas, possibly reducing or negatively impacting habitat for listed species.

The impact to listed species on the Inyo National Forest would be limited, however. In the case of SNBS, their summer range, between 8,000 to 14,000 feet, is in environments typically not susceptible to noxious and invasive weed infestations. These environments tend to have low vegetation densities due to the granitic, rocky soil types, short growing season and other ecological factors, as well as a lack of disturbance and vectors. No high-priority invasive plants are currently known to occur in these environments. Therefore, expansion of invasive species is likely to have only a small impact to native vegetative in SNBS habitat.

For the other listed species, which are fish and amphibians, weeds indirectly cause degradation to riparian conservation areas objectives because they can affect the ability of riparian vegetation to provide beneficial functions such as providing cold, clean water; stream shading; aquatic/riparian habitat for indicator; and nutrients. Over the long term, if noxious weeds were to spread substantially, they could affect the composition of riparian vegetation in the habitat of these listed species, but currently, the acreage of noxious weeds are not large enough to affect critical habitat features for these species, and there is little habitat of these species in or adjacent to known invasive plant populations.

3.3.2 Forest Service Sensitive Wildlife Species

The Biological Evaluation (BE) (Schlick, 2019b) addresses the potential effects of the invasive plants project for the Inyo National Forest on animal species listed as sensitive by the Regional Forester of the Pacific Southwest Region of the U.S. Forest Service. Sensitive species include species not designated as federally threatened or endangered, but for which range-wide rarity is of concern. The sensitive animal species list for Region 5 of the Forest Service was last updated on September 9, 2013. The effects of the invasive plants project on Inyo National Forest sensitive species are evaluated below. The purpose of the Biological Evaluation is to evaluate if this project contributes to loss of viability of any forest sensitive animal species.

The Region 5 sensitive species that are known to, or likely to, occur on the Inyo National Forest, which are analyzed in the BE, are:

- Greater sage grouse bi-state distinct population segment
- Bald eagle
- Great gray owl
- Northern goshawk
- California spotted owl
- Willow flycatcher
- California golden trout
- Amphibians: Black toad and Inyo Mountains Salamander
- Springsnails: Wongs and Owens Valley
- Butterflies: Apache fritillary, Boisduval's blue & Mono Lake
- Mesocarnivores: American marten, Pacific fisher & Sierra Nevada red fox (sierra nevada dps)
- Bats: townsend big-eared, pallid, western red & fringed myotis
- Pygmy rabbit

For all species, the analysis considered the potential to affect species through the following:

1. Disturbance of individuals from noise or visual disturbance associated with treatments
2. Secondary effects upon habitat
3. Toxicity from acute or chronic exposure to herbicides

3.3.2.1 Alternative 1

Effects to each sensitive species are discussed in the Biological Evaluation for this project (Schlick 2019b). In this EA, the effects to all sensitive species are grouped into one summary. This is because overall effects are similar for all sensitive species. Individual differences are discussed where relevant.

3.3.2.1.1 Direct and indirect effects

There could be some temporary displacement of individuals from noise or visual disturbance associated with treatments, including herbicide, manual or mechanical, and cultural treatments. Disturbance would generally only occur in a given treatment area for a day or a few hours. Each site could potentially be revisited once or twice in the same growing season. Design feature #27 provides specific protection for the greater sage grouse bi-state distinct population segment, by avoiding any invasive plant treatments in sage-grouse habitat during the breeding and nesting seasons. Because of the short duration of disturbance, and limited area treated, compared to these sensitive species' ranges, the direct effects from disturbance will be minor and temporary and affect individuals only.

Secondary effects on habitat would be short-term and over a small area, if there are any effects at all. Only very small percentages of any species' habitat will be treated. Areas that are treated manually will likely revegetate within the same growing season or by the following year. Effects to non-target vegetation from herbicides will be minimized by using the most selective method and formulation that provides effective control as determined during the annual implementation process and in accordance with the project design features. Over the long term, control and eradication of invasive species will help maintain quality habitat for sensitive species.

The ecological effects of herbicide use are discussed in the Herbicide Toxicity section of the BE (Schlick 2019b). In summary, there are no acute or chronic exposure scenarios at application rates described in the Proposed Action that will result in a Hazard Quotient (HQ) above one for any of the sensitive species (as determined using species with similar forage types). Herbicides and surfactants applied as described in the Proposed Action pose no risk to these species. Triclopyr was the only chemical where hazard quotients exceeded the level of concern for exposures to any species type. For herbivorous birds only (sage grouse is the only species that fits into this category), the hazard quotient was greater than one. However, the HQs are based on worst case scenario exposures and do not account for factors such as timing and method of application, animal behavior and feeding strategies and/or implementation of project design criteria. Triclopyr will not be broadcast sprayed, and selective application will prevent any negative direct effects to sage grouse. No other herbicide exceeded thresholds of concern for any animal species.

3.3.2.1.2 Cumulative Effects

For the purpose of this analysis, cumulative effects include those that have the potential to impact or have impacted the breeding, foraging, or nesting areas within the project area in the past, present or foreseeable future. The largest threat to these species is loss or alteration of habitat, or in the case of the fish species, hybridization and predation by non-native animal species. The effects from the proposed action would not incrementally result in negative impacts.

Over the long-term, treatment of noxious weeds will help protect and maintain habitat quality for these species. This project provides rapid response to eliminate and control weeds that could prevent infestations from expanding and adversely affecting native plant communities. If left untreated, a type conversion of native plants to non-native noxious weeds would over time potentially affect the foraging availability by diminishing habitat quality for prey.

Treatment of noxious weeds, particularly salt cedar, in habitat for fish and amphibian species will over the long term help protect and maintain habitat quality for these species. Rapid response to eliminate and control new weed occurrences, will ensure that infestations do not get larger and that native plant communities are protected. If left untreated, a type conversion of native plants to non-native noxious weeds would over time potentially affect hydrology and diminish habitat quality for aquatic species.

3.3.2.2 Alternative 2

Of the Forest Service Sensitive species analyzed here, there would be no direct effects to individuals or their current habitat conditions as a result of the No Action Alternative. Previously approved manual and chemical control methods would continue to be applied to invasive plant infestations known as of 2007.

Indirectly, acreage of existing infestations would most likely increase as current control methods have proven inadequate and do not address new infestations. As a result, infestations would be expected to slowly increase in spatial extent and density, and these infestations could be the seed source resulting in new infestations within the project area. Over time, this could result in a reduction in native plant species and healthy, native plant communities in the affected areas, possibly reducing or negatively impacting habitat for sensitive species and locally desirable native species including pollinators.

3.4 Watershed – Water Quality and Soils

This analysis is summarized from the Water Quality Assessment (Ellsworth 2018a) and Soil Specialist Report (Ellsworth 2018b), which are incorporated by reference and in the project record.

Soils in the project area are developed from granitic, metamorphic and volcanic rock. Pumicious soils with ash are common in the northern parts of the Forest. Glacial and alluvial materials derived primarily from granitic rocks, but with some metamorphic and volcanic rocks (USDA, 1995), are common on the eastern slope of the Sierra Nevada. Soils are generally coarse textured, with most having coarse sand, loamy coarse sand, and sandy loam surface layers, and are therefore normally well drained. The White and Inyo Mountains are composed of many layers of different sedimentary and metamorphic rocks, with resulting variable soils which are generally shallow (USDA, 1993). Slope steepness ranges from 0-75%.

There are relatively few areas on the Forest with widespread accelerated erosion beyond the natural range of variability. Many erosion issues can be addressed through mitigations or restoration activities, or through project design with the installation of appropriate drainage and erosion control techniques.

Water quality on the Inyo National Forest is generally good, due to low population and levels of development. The Forest currently has three (3) waterbodies on the State water board’s 303(d) list of impaired waterbodies: Hilton Creek, Mammoth Creek and Rock Creek. None of these waterbodies are listed due to pesticides/herbicides by the LRWQCB (accessed on the Web on December 3, 2018).

Water and soil quality risk factors are identified by assessing three potential contaminant pathways as well as effects to soil micro-organisms, which will be discussed as indicators in this analysis:

1. Herbicides directly entering water bodies (including groundwater) by heavy storm runoff, accidental spill and fugitive drift from spray application, or leaching through soils.
2. Localized erosion and transport of soil to water bodies due to loss of vegetation cover.
3. Leaching and off-site movement of herbicides.
4. Risk to soil micro-organisms.

The Lahontan Water Quality Basin plan states that "the discharge of pesticides to surface or ground waters is prohibited" (LRWQCB Basin Plan 1995). The project is designed to avoid any discharge of herbicides into any water body, and the analysis explains how the determination was made that the project will not allow any herbicides to enter water bodies. Risk assessments and monitoring studies of herbicide use in forested areas were used to substantiate design features that protect water bodies from potential adverse effects of the proposed treatments. Design Features (1-12, 32-37, Table 3) are outlined in Section 2.1.8 of the EA.

3.4.1 Alternative 1

3.4.1.1 Direct and Indirect Effects

Herbicides can reach surface or ground water by three major routes: drift from spray, leaching through soil to groundwater, and surface runoff to surface waters. All of these potential routes are discussed here.

Treatments will not occur in water or on aquatic plants. Therefore, there will be no direct application of herbicide to water. Treatments within Riparian Conservation Areas (RCA) adjacent to live water have drift or leaching potential, primarily due to their relatively shallow water tables. Design features to lower the risk of water quality impacts on these soils consist of buffers, avoiding chemical application when precipitation is imminent or winds elevate the risk of drift, and prescribing application methods that use the minimum amounts of herbicide, such as cut-stump treatment and wiping. With these design features, there will be no herbicide entry into surface or groundwater through any route.

Accidental spills are not considered within the scope of the project. Project design features would reduce the potential for spills to occur, and if an accident were to occur, minimizes the magnitude and intensity of impacts. An herbicide transportation and handling plan is a project requirement. This plan will address spill prevention. Typically approximately ½ gallon of concentrated herbicide will be transported at any one time, though more or less may be transported.

Chemicals can be transported through soil via subsurface or groundwater flow and have the potential to reach surface water bodies. Dispersal of groundwater through soil would increase chances of herbicide chemicals adsorbing into soil. The implementation of BMPs and design criteria minimize the chance of herbicides reaching live water through drift, runoff, or groundwater movement. Aminopyralid, Chlorsulfron, Imazapyr and Triclopyr are on the 6800 groundwater protection list under the California Code of Regulations' Pesticide and Pest Control Operations as having the potential to pollute groundwater (3CCR section 6800[a]) (California, Department of Pesticide Regulation, accessed from internet on 9/20/2018). Given the rate, frequency, and method of application, degradation and dilution, and the implementation of design criteria, the risk of groundwater contamination from the use of herbicides in this project is extremely low. Roads and their associated ditch lines are often connected to streams and during storm events can carry herbicide to streams. However, as the vast majority of sites would use direct spray or select application, with the exception of the broadcast spray sites, very little herbicide would be applied to soil so it would not be available for transport to streams.

Broadcast application of Aminopyralid, Clethodim, Clopyralid, Fluazifop and Glyphosate could occur. The risk of offsite movement is highest with Aminopyralid and Clopyralid given their longer soil half-life (as compared to the other chemicals proposed) and leaching potential. Broadcast spraying could occur adjacent to roads which are compacted surfaces and can transport runoff water entrained with herbicide. The risk of offsite movement is low due to residual soil cover with directed spray and select application, design features that preclude spraying when storms are approaching, high infiltration rates, and high density of weeds to provide interception and soil cover and potential reseeding for rapid vegetative recovery where broadcast spraying takes place.

The targeted spray and hand application treatments proposed with this project are far less likely to deliver herbicide to water than broadcast treatments because the herbicide would be applied to individual plants, so drift, runoff, and leaching are greatly minimized. Small amounts of some herbicides can translocate from the plant to the soil or an adjacent plant, but the concentrations of herbicide that may be delivered to streams from this mechanism is slight given the project design, stream buffers, and implementation of BMP's.

The proposed chemicals are non-persistent to moderately persistent (except for Imazapyr) in soil, which limits the risk to water quality. Imazapyr is moderately persistent to persistent. It can be susceptible to surface runoff, and leaching form dead roots. This project proposes to only spray imazapyr directly onto plant surfaces, or wick and wipe it on rather than broadcast spray or incorporate into the soil. Because of this leachability there is a project design criteria that address the application of imazapyr on deep, coarse textured, saturated soils (DF #36). The estimated maximum soil concentrations are far below any potentially toxic levels to soil organisms. Thus, there does not appear to be any basis for asserting that imazapyr is likely to affect soil microorganisms adversely (SERA, 2011).

Overall, the proposed herbicide types and application rates are expected to facilitate decay by soil microbes. Risk to soil microorganisms is low. Where plants are killed, the residue would continue to provide some soil cover until new plants establish. The treatment areas are generally small and discontinuous, reducing the possibility of transport via wind or water erosion. The potential for adverse effects of herbicide residues in soil would be minimized or eliminated by incorporating the project design features and applying BMPs for herbicide application.

3.4.1.2 Cumulative Effects

Cumulative effects to soil and water quality are not expected because of the following factors: the small, dispersed treatment sites, the minimal ground disturbance caused by removal of individual plants using manual/physical methods, the site-specific application of chemicals that degrade within a matter of days to months, the use of buffers along streams and hydrologic features, and the implementation of relevant design criteria and BMPs. Many of the watersheds will not receive treatment during the project period. Only National Forest System land and roads would be treated in the Proposed Action. The Forest, however, is intermingled with other Federal, state, county, and private ownerships. Management activities and actions on neighboring lands may contribute to the spread of invasive plants on NFS lands, and vice versa. However, with the suite of treatments proposed in this project the cumulative effects on NFS lands would be negligible; because, as new infestations occur, they could be treated effectively.

This analysis addresses effects to soils that occur directly on site or adjacent to where treatments occur. Cumulative Effects are considered for a 10 year horizon. This timeframe generally encompasses the life of the project and time it can take for expected vegetative recovery.

The impacts to soils from manual and mechanical and cultural control methods would be negligible, and would not be additive to planned disturbances from fuels treatments, residential and roadway construction activities, and recreation activities.

Low application rates and application methods that target individual plants, would limit herbicide contact with soils and ensure that soil organisms would be minimally impacted by chemical treatments. The proposed herbicides are non-persistent to moderately persistent (expect for Imazapyr) and these chemicals would not build up in the soil and would be unlikely to affect water quality, when applied as directed on the label and with the design features specified herein.

Cumulative effects to soils from proposed manual, mechanical, and chemical treatments would be negligible under current and expected future infestation levels.

3.4.2 Alternative 2

3.4.2.1 Direct, Indirect, and Cumulative Effects

No new invasive plant treatments would occur outside of ongoing treatments. The current methods (approved in the 2007 EA) have not proved adequate to eradicate or control the spread of known invasive plants and do not allow for treatment of new infestations. The No Action alternative would result in continued spread of weeds on the Forest, with accompanying impacts to soils.

Lack of effective treatments would allow the continued spread of invasive plants and the associated changes in ecosystems. There may be a reduction in riparian vegetation diversity and reduced quality of aquatic habitat in localized situations. Stream bank stabilization will be diminished as seed species replace deeper rooted native plants in certain areas. Stream shading will be diminished as native hardwoods and conifers are outcompeted by weeds in very localized areas. Herbicide would continue to be used by hand application only per the current Weed EA. There would be no direct or indirect effects to channel morphology, stream flow, or water quality from this alternative.

Weeds can change soil biology (microbial communities and other soil organisms) as well as soil nutrient and carbon status, usually with negative effects to native plant communities. For example, both spotted and diffuse knapweed release chemicals into soil that suppress soil microbes and native plant growth (Vivanco et al 2004). There is evidence that cheatgrass may alter soil microbial community composition, decreasing mycorrhizae that some native plants depend on for optimal nutrient uptake and growth, improved water relations and other benefits (Belnap & Philips 2001).

Invasive species can destabilize native plant communities through their impacts on nitrogen dynamics, changing N availability by changing litter quantity and quality, rates of N^2-fixation, or rates of N loss (Evans et al 2001). Changes in nitrogen dynamics may also change soil pH (Ehrenfield et al 2001).

Cheatgrass may alter nitrogen availability to its advantage and the detriment of native plants (Rowe et al 2008). Soil organisms that decompose organic matter have demonstrated preferences for particular substrates, so altering the soil organism community may affect below-ground carbon storage (Ekschmitt et al 2008). Since soil structure is partially dependent on soil biology, disrupting the soil biological community may eventually result in changes to soil structure (Young et al 1998). Given the known impacts of some species of weeds, impacts to some soil organisms could be greater under No Action if infestations continue to increase

3.5 Heritage Resources

3.5.1 Alternative 1

The Proposed Action Alternative would have no direct, indirect or cumulative effects on historic properties. NHPA Section 106 compliance requirements have been fulfilled as a Screened Undertaking (Class B) in accordance with the *Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), the California State Historic Preservation Officer, the Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forest of the Pacific Southwest Region (2012, Amended 2018).* The undertaking will have no effect on historic properties provided annual implementation activities meet one or more of the following criteria:

a. Non-disturbing broadcast seeding and mulching for establishment of vegetation [1.1(e)].

b. Activities that involve no ground or surface disturbance and will not affect Indian access to or use of resources [2.3(d)].

c. Ground disturbing activities limited to obviously disturbed contexts [2.3(f)].

d. Applications of pesticides, biocontrol agents or herbicides application that do not have the potential to affect access to or use of resources by Indians based on the nature of the undertaking or prior or current consultation with tribes [2.3(g)].

e. Activities that involve less than one cubic meter of cumulative ground disturbance per acre where such activities would not affect the integrity of historic properties [2.3(i)].

f. Removal of non-native, invasive plant species using hand tools so that the integrity of cultural resources, if present, is not affected [2.3(dd)].

The Forest Archaeologist would be consulted during the Annual Implementation Process to ensure proposed treatments meet the criteria above. If spot surveys or site inspections are performed in support of annual implementation, or adjustments are made to protect historic properties or tribal interests, monitoring reports would be prepared to document this work (Beidl 2018: R2018050402554).

3.5.2 Alternative 2

The No Action Alternative would have no direct, indirect or cumulative adverse effects on historic properties. Projects would implemented in compliance with NHPA Section 106 and designed to avoid effects to cultural resources.

3.6 Recreation and Wilderness

The Inyo National Forest is heavily utilized for recreation. There are many developed recreation facilities, such as campgrounds, trailheads, and boat launches, as well as dispersed recreation areas used for camping, fishing and hunting, rock-climbing, wilderness access, and access via an extensive system of roads and trails. The project area contains nine congressionally designated wilderness areas (or portions thereof): Hoover, Ansel Adams, John Muir, Owens Headwaters, Boundary Peak, White Mountains, Inyo Mountains, Golden Trout, and South Sierra Wilderness Areas, totaling approximately one million acres. These areas are managed to maintain and protect wilderness values, including ecological values (e.g. naturalness, ecological integrity, biodiversity).

3.6.1 Alternative 1

Some of the treatments under the proposed action could have a short-term (one season or less) effect on visitor use, primarily in developed recreation sites and concentrated visitor use areas. Visitors might avoid areas when workers are present or where chemical treatments have been implemented during the posted effective time, or for the entire growing season if dead vegetation is evident. Any impacts are expected to pose a minor inconvenience that would last a brief time period and affect only a small portion of any recreation use area. Design features would reduce impacts to Forest visitors by providing public information prior to and at the time of treatments, to assist visitors in avoiding treatment areas, and by scheduling treatments to avoid high visitor use periods (DF #13, 14, 15). Treatment of invasive species would promote maintenance of native vegetation and the natural character of the landscape, which are key reasons why recreationists visit the Inyo National Forest. The Human Health and Risk Assessment addresses potential for chemical exposure by Forest visitors engaged in recreation and other visitor activities.

Under the Proposed Action, infestations in Wilderness would be treated by hand-pulling (manual) methods whenever feasible and effective (DF #40). Minor impacts from hand-pulling might include visitors noticing signs of activity by workers, pulled weeds left on the ground to dry, or small patches of bare ground. However, visible disturbance would be minor, short-term, and have minimal consequence to a visitor's experience in the wilderness. Where herbicide application is the only effective treatment option and determined to be the minimum activity necessary to preserve wilderness character (DF #42), a Minimum Requirement Decision Guide (MRDG) and Pesticide Use Proposal (PUP) would be submitted to the Regional Forester for approval prior to implementation. Similarly, use of mechanical tools (e.g. hand-held power tools such as chainsaw or string-trimmer) would be in very limited circumstance when hand tools are insufficient and would also be reviewed in a site-specific MRDG during the Annual Implementation Process. Examples include cutting a very large tamarisk tree with a chainsaw or string-trimming an extensive perennial pepperweed infestation prior to herbicide application; these activities would possibly have a short-term effect on visitor experience, primarily due to noise. In addition, all proposed treatment sites (manual, mechanical or herbicide) in designated wilderness would be reviewed annually during the Annual Implementation Process by a recreation/wilderness specialist from the Project IDT. At that time each year, modifications or restrictions on the proposed treatment could be developed to further minimize impacts to wilderness character and wilderness experience for users.

There are currently two species of high priority invasive plant species with known infestations in designated wilderness for which herbicide application is the only effective treatment method: perennial pepperweed and tamarisk (Table 7). Some of these infestations have had partial treatment by pulling, cutting, or with herbicide under previous NEPA decisions, although follow-up treatment is still needed (such as treating re-sprouts, or searching adjacent areas and treating additional plants if found). It is expected that the project MRDG and PUP would evaluate treatment of these known infestations as well as future infestations that would be of similar size and scope. Should new infestations be discovered, the MRDG and PUP would be updated to reflect the new information. Generally speaking, species that are likely to be proposed for treatment with herbicide in wilderness would be limited to Priority 1 and 2 species (see Appendix A) that are perennial and rhizomatous (e.g. pepperweed, whitetop, Russian knapweed, Canada thistle) or woody species (e.g. tamarisk, Russian olive).

The Proposed Action is expected to have a long-term beneficial effect to the natural quality of wilderness character by providing effective control of current and future infestations of invasive plants and protecting the ecological values of wilderness. Controlling and eradicating infestations when they are small can reduce resource impacts overall, compared to the potential effects and resources required when treating a larger, established infestation. Treating infestations on adjacent NFS land would reduce the likelihood of their spread into wilderness (such as at trailheads or along cherry-stemmed roads). Any management activity in wilderness including treating of invasive plants is a trammeling and affects the untrammeled quality of wilderness. In the case of treating invasive plants, especially with hand pulling, the treatment will be designed such that the benefits of preserving natural character and ecological conditions outweigh the short term trammeling of treatment activities.

Table 7. Status of known high-priority invasive plant infestations in designated Wilderness Areas with potential treatment method involving herbicide.

District	Wilderness	Location	Common Name	Site ID	Acres	Description	Status	Treatment Method	Herbicide
White Mountain	White Mountains	Marble Creek	tamarisk	TARA_021	0.2	single large plant in canyon bottom	No previous treatment	Cut-Stump	Triclopyr
Mt. Whitney	John Muir	Sardine Canyon Trailhead	tamarisk	TARA_043	4.1	handful of small dispersed plants along ~1/4 mile of SF Oak Creek	Follow-Up Needed	Hand-Pull or Cut-Stump resprouts	Triclopyr
Mt. Whitney	John Muir	Pass Trailhead	tamarisk	TARA_049	0.1	single large plant in creek gully	Follow-Up Needed	Cut-Stump resprouts	Triclopyr
Mt. Whitney	South Sierra	Kennedy Meadows Trailhead	tamarisk	TARA_050	0.1	single small plant found and pulled in 2015	Follow-Up Needed	Further Survey; Hand-Pull or Cut-Stump	Triclopyr
Mt. Whitney	Golden Trout	Ninemile Creek Trail	perennial pepperweed	LELA_002	0.4	dispersed along small draw crossing the trail	Follow-Up Needed	Directed Foliar Spray	Telar or Glyphosate
Mt. Whitney	Golden Trout	Jordan Hot Springs	perennial pepperweed	LELA_007	0.5	small dense patches adjacent to hot spring and downstream	No previous treatment	Directed Foliar Spray and Hand Wiping	Telar or Glyphosate
Mt. Whitney	Golden Trout	Soda Flat	perennial pepperweed	LELA_010	0.9	multiple dense patches in alkali meadow below cabin	No previous treatment	Directed Foliar Spray and Hand Wiping	Telar or Glyphosate
Mt. Whitney	Inyo Mountains	Paiute Canyon	tamarisk	TARA_042	0.3	eight medium plants in canyon bottom	Follow-Up Needed	Cut-Stump resprouts	Triclopyr

3.6.2 Alternative 2

Under the No Action Alternative, invasive plant infestations would not be sufficiently controlled and could expand in areas of concentrated public use such as along roads and trails or at developed and dispersed recreation sites. Invasive plant infestations in areas that the public uses could have an adverse effect on native vegetation and other resources that contribute to the natural character and visitor experience. As infestations expand, there would be an increased likelihood they would spread into wilderness areas. If invasive plant infestations are found in wilderness in the future and are not sufficiently controlled or eradicated, there could be an adverse impact to the natural quality and ecological conditions of the wilderness.

3.7 Human Health and Safety

This section summarizes the potential for adverse health effects in workers and members of the public from the proposed use of eight herbicides (Table 1), based on the Human Health and Safety Report (Engelhardt 2018c). Workers include applicators and any other personnel directly involved in the application of herbicides. The public includes forest workers who are not directly involved in herbicide application and forest visitors.

Effects to human health were predicted using herbicide risk assessments to characterize the effects of the Proposed Action. The Forest Service contracts with Syracuse Environmental Research Associates, Inc. (SERA) to evaluate human health and ecological effects of herbicides using EPA studies and other peer-reviewed articles from the open scientific literature. The SERA risk assessments are considered the best available science for this project because they disclose effects from the types of chemical application done by the Forest Service, for purposes such as treating noxious weeds as proposed in this document, as opposed to settings such as agriculture. Only herbicides that have SERA risk assessments are proposed in this action.

3.7.1 Analysis Methods

Methods used in the risk assessments are described in detail within those reports and summarized briefly here. To assess human health risks, the SERA reports compare the dose of herbicide received by a person under lower, central and upper exposure scenarios with the corresponding herbicide “Reference Dose” (RfD) established by EPA or by the Forest Service/SERA risk assessment for acute and/or chronic exposures. If doses from estimated exposures for a specific Forest Service herbicide application are less than the RfD’s, there would be no indication of a risk of health effects. The Hazard Quotient (HQ) is the ratio of the estimated level of exposure compared to the RfD. When a predicted dose is less than the RfD, then the HQ (dose/RfD) is less than 1, and toxic effects are unlikely for that specific herbicide application (i.e., the use is presumably safe).

The risk assessments quantify expected exposures and calculate the HQ’s. These estimates provide a range of values (lower, central and upper) rather than relying on a single estimate. The upper exposure estimates are based on the maximum estimate for every exposure factor that is considered, which is very unlikely to occur in forest service operations (e.g., maximum application volume, maximum concentration in field solution, maximum volume of a spill, maximum residue rates on food items, maximum exposure rates, maximum hours worked). The upper exposure estimates are not reflective of the way herbicides would be used in this project and the probability of maximum exposures occurring is very low. Thus, the central and lower estimates provide more realistic risk assessment results and are reported here.

3.7.2 Project Measures to Protect Human Health

The proposed action includes project design features intended to minimize or eliminate the potential for harmful herbicide exposure to workers and the public (DF #s 1-4, 7, 13-15, 36). Implementation of the project design features in addition to following label directions will further protect human health.

All herbicides will be applied following label directions, regulations of the California Department of Pesticide Regulation and Nevada Department of Agriculture, Forest Service Manual and Handbook direction, Inyo NF Job Hazard Analyses, and the project design features.

3.7.3 Alternative 1 – Proposed Action

Under Alternative 1, label direction and project design criteria would minimize or eliminate the potential for worker and public exposure to hazardous levels of herbicides, based on existing Risk Assessments. No individual worker or public exposures of concern are predicted. The herbicide labels and project design features ensure that herbicides and surfactants are used in rates low enough, or methods selective enough, to avoid exposures above the no observable adverse effect level (NOAEL).

No adverse effects to water sources or public health and safety are predicted. The risk of an accidental spill is not linked in a cause-and-effect relationship to how much treatment of invasive plants is projected for a particular alternative or herbicide; a spill is a random event. A spill could theoretically happen whenever herbicides are transported. The potential risk of human health effects from large herbicide spills into drinking water are mitigated by design features that require mixing away from water sources (DF #6), limits on herbicide use near water (Table 3, EA), and that safety and emergency spill plans be developed as part of all project safety planning (BMP 5.10). Typical applications conducted by the Inyo NF in the past have transported less than a half-gallon of herbicide concentrate in vehicles, often even less (pint or less).

3.7.3.1 Direct and Indirect Effects to Workers

Herbicide applicators are more likely than the general public to be exposed to herbicides, and may handle undiluted herbicide concentrate during mixing and loading. In routine broadcast and spot applications, workers may contact and internalize herbicides mainly through exposed skin, but also through the eyes, mouth, nose, or lungs. Worker exposure is influenced by the application rate selected for the herbicide, the number of hours worked per day, the acres treated per hour, and variability in human dermal absorption rates.

All herbicides can cause irritation and damage to the skin and eyes if mishandled. Eye or skin irritation would likely be the only overt effect as a result of mishandling the proposed herbicides. These effects can be minimized or avoided by prudent and required industrial hygiene practices during handling. Worker exposure can be effectively managed through ordinary prudent practices and use of personal protective equipment (PPE) required by law for applicators.

The Risk Assessments summarize risks for backpack and broadcast spraying under normal application and maximum exposures. Exposure levels that were evaluated range from predicted average exposure to worst-case exposure. Risks from accidental/incidental exposures are also evaluated. Backpack spray exposures assume that workers on average treat approximately four acres per day (ranging from 1.5 to 8 acres per day) and broadcast spray exposures assume that workers average 112 acres per day (ranging from 66 to 168 acres per day). For all scenarios, it is assumed that the workers do not receive any protection from exposure provided by clothing, though in reality, applicators do wear personal protective equipment during all applications including long sleeves, pants, socks and shoes, eye protection, and gloves.

Two general types of exposure are modeled: one involving direct contact with a solution of the herbicide and another associated with accidental spills of the herbicide concentrate onto the surface of the skin. Exposure scenarios involving direct contact with herbicide solutions are characterized by immersing unprotected hands for 1 minute or wearing contaminated gloves for 1 hour. Workers are not likely to immerse their hands in herbicide; however, the contamination of gloves or other clothing is possible.

Exposure scenarios involving chemical spills onto the skin are characterized by a spill onto the lower legs as well as a spill onto the hands. In these scenarios, it is assumed that a solution of the chemical is spilled onto a given surface area of skin and that a certain amount of the chemical adheres to the skin.

The maximum application rates allowed per label instructions were evaluated for this EA, though application rates in the field can often be much lower, depending on the species and the method. Most of the herbicides proposed for use have low potential to harm workers. In most cases, even when maximum rates and upper exposure estimates were considered, hazard quotient values were nearly all below the threshold of concern, with a few exceptions. At the upper exposure estimate, clethodim and fluazifop slightly exceeded the level of concern (HQ=1.3 and 2, respectively) for backpack applications, but could be associated with poor personal hygiene practices during application and assume greater application time and area than are likely in this project. The upper bound for accidental exposure to clethodim for a worker wearing contaminated gloves has an HQ=4; this could easily be mitigated by promptly removing contaminated gloves and washing hands. At the upper exposure estimates, triclopyr exceeds an HQ of 1 for all application methods; however the central estimates of the HQs do not exceed a level of concern for any applications. Most of the risk for triclopyr TEA is due to high risk for eye irritation, which can be mitigated by following proper safety practices and using required PPE.

3.7.3.2 Direct and Indirect Effects to the Public

The general public is unlikely to be exposed to more than very minor levels of any herbicides used in the implementation of this project. However, to show possible maximum effects, the SERA Risk Assessments considered several exposure scenarios including direct contact, consumption of sprayed vegetation, consumption of drinking water adjacent to a spray operation, and consumption of fish in water adjacent to a spray operation. Accidental exposures including drinking water from a pond contaminated by a large spill were also considered.

Direct Contact: Exposure is quantified from direct spray and contact with sprayed vegetation scenarios. At the maximum application rates proposed in the proposed action, low risk to human health are indicated from direct contact. No scenarios for direct spray or contact with sprayed vegetation resulted in HQs over the threshold of concern. The design features include specific notification and posting requirements for administrative and recreation sites to further reduce the possibility of inadvertent direct spray of a member of the public.

Indirect Contact: Quantitative estimates of exposure were conducted for an adult female swimming for 1 hour in water contaminated by runoff from a treated 10-acre slope. All herbicides had HQs orders of magnitude below a threshold of concern for this scenario, indicating no plausible risk to the public from this exposure. This project will treat few areas over 10 acres, so even this low-risk scenario is very unlikely.

Eating Contaminated Vegetation or Fruit: The public could be exposed to herbicide if they eat contaminated vegetation or fruit that was sprayed, such as berries, mushrooms, or other plants. Directly sprayed plant materials would likely show signs of either dye or herbicide damage, reducing the likelihood they would be consumed. Non-target berries or mushrooms could also be contaminated by drift or uptake from the soil, which would result in lower herbicide residues than direct spraying.

At the central estimate, only triclopyr resulted in a HQ greater than 1 for either acute or chronic exposures from eating contaminated vegetation. For a young woman consuming contaminated vegetation, the upper bound HQ is 27 for acute exposure and 6 for chronic exposure. Consumption of fruit did not exceed an HQ of 1 (SERA 2016). In the proposed action, triclopyr would only be applied by cut stump, directed foliar spray or wiping. Using these methods, only small areas of vegetation would be treated, and the applicator would be able to spray only target plants, which are not edible vegetation. Therefore, it is extremely unlikely that anyone would consume a substantial amount of this herbicide as a result of the Forest's applications. If an adjacent edible species was accidentally sprayed by drift, it would fall well within the low application rate hazard assessment, which is less than the threshold of concern for human health.

Drinking Contaminated Water: Risks from drinking contaminated water were evaluated for an accidental spill and water contaminated by runoff. The risk assessments also evaluated an accidental exposure scenario where a small child drinks 1 liter of water from a quarter-acre pond, immediately following a spill, into which the contents of a 200-gallon tank that contains herbicide solution is spilled. Although a 200-gallon spill is highly unlikely, it is possible if there were an accident on-site. Applicators usually store, transport and use less than 50 gallons of mixture, even for broadcast application. This amount is not driven on the highways, just mixed and stored on-site for filling smaller tanks on UTVs with booms, or for direct spraying from the truck.

Even with the above unlikely scenario, no herbicides resulted in HQs greater than 1 for drinking contaminated water in either acute or chronic scenarios. All calculated HQs were many orders of magnitude below the threshold of concern, except for clopyralid at the upper exposure bounds (HQ=2), which is highly unlikely to occur in this project as described above.

Consuming Contaminated Fish: Both acute and long-term exposure scenarios involving the consumption of contaminated fish were evaluated using the herbicide concentrations in the contaminated water scenarios described above. Acute exposure was based on the assumption that an angler consumes fish taken from contaminated water shortly after an accidental spill into a pond. Chronic exposures were assumed to occur over a lifetime of eating contaminated fish. People who subsist on fish (for example Native American Indians) could have higher exposure rates than recreational anglers. However, even based on a lifetime of subsistence fish consumption, no HQ values greater than 1 are associated with the herbicide use proposed in any alternative. Therefore, eating contaminated fish is unlikely to affect any human health parameter.

Endocrine Disruption: The potential for the proposed herbicides to cause endocrine disruption effects was addressed in each risk assessment. The United States Environmental Protection Agency has determined that there is no basis for asserting that aminopyralid would cause adverse effects on the immune system or endocrine function (SERA 2007). No evidence for chlorsulfuron producing direct effects on the endocrine system was found (SERA 2004b). In the review of the mammalian toxicity data on imazapyr, U.S. EPA Office of Pesticide Programs concluded that "there was no evidence of estrogen, androgen and/or thyroid agonistic or antagonistic activity shown." SERA (2011b) found that this conclusion was reasonable, based on their review of current information in the 2011 imazapyr risk assessment. None of the EPA/OPP risk assessments or European risk assessments express concern for the potential effects of clethodim on edocrine function (SERA 2014).

The glyphosate risk assessment (SERA 2011a) stated that "some recent studies raise concern that glyphosate and some glyphosate formulations may be able to impact endocrine function through the inhibition of hormone synthesis (Richard et al. 2005; Benachour et al.2007a, b), binding to hormone receptors (Gasnier et al. 2009), or the alteration of gene expression (Hokanson et al. 2007)" (all references as cited in SERA 2011a). Evaluation of the studies indicates that endocrine disruption effects were indicated for surfactants in the formulations rather than glyphosate itself. No premixed glyphosate formulas are proposed for use. A commercial surfactant would be added to glyphosate when preparing the solution for application, but the surfactant type would be a methylated seed oil/crop oil concentrate, which is typically a corn oil derivative and not implicated in causing endocrine effects. No POEA or NPE based surfactants would be used.

Triclopyr has not undergone evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems (i.e., assessments on hormone availability, hormone receptor binding or post-receptor processing). However, extensive testing in experimental animals provides reasonably strong evidence that triclopyr is not an endocrine disruptor. No epidemiological studies of health outcomes of triclopyr have been reported, and there is no clinical case literature on human triclopyr intoxication. Several long-term experimental studies in dogs, rats, and mice have examined the effects of exposure to triclopyr on endocrine organ morphology, reproductive organ morphology, and reproductive function; treatment-related effects on these endpoints were not observed.

While the potential for the proposed herbicides to cause endocrine disruption effects is not entirely known for all chemicals, the potential for any effects to actually occur are unlikely because of the low apparent risk, the small areas treated, and measures such as required use of proper protective equipment, public notification, use of licensed applicators, training, and limited application rates.

3.7.3.3 Cumulative Effects

Workers and the public may be exposed to some small amount of herbicides used to treat invasive plants under the proposed action. Cumulative effects are possible within the context of this project, or when combined with herbicide use on adjacent lands or home use by a worker or member of the general public. The potential for cumulative human health effects from any herbicide use proposed in this EA, combined with other potential herbicide applications in the analysis area, would be encompassed in the health risks estimated for chronic exposure scenarios. Chronic (daily exposure for a 90-day period) worker exposure was considered in SERA Risk Assessments and did not result in exceedance of thresholds for any likely scenario.

There is ongoing use of herbicides and other methods to treat invasive plants by other federal, state, and county agencies adjacent to the Forest. Known herbicide use on adjacent lands is expected to pose a similar risk to workers and the public as the herbicide use proposed for this project. However, the potential contribution to cumulative pesticide use by the action alternative is not significant. The generally small and scattered nature of the high-priority infestations on Forest land make it unlikely that exposures exceeding a level of concern would occur from simultaneous herbicide treatments on Forest Service and adjacent lands.

3.7.4 Alternative 2 – No Action

Under Alternative 2, herbicide use on the Inyo NF would be restricted to treatment methods, locations and herbicides analyzed and approved under previous NEPA decisions (INF 2007, 2010, 2017). These decisions allow the application of chlorsulfuron, glyphosate, imazapyr, and triclopyr, by hand methods only (e.g. painting, wiping, wicking). Potential effects to human health are discussed in the Environmental Analysis for these previous decisions, which are incorporated by reference. Both documents determined that there was a low risk of effect to human health from the proposed herbicide use due to the restrictive application methods, use of required PPE, and following label directions as required by law.

4. Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, and tribes, as well as other organizations and individuals on the INF scoping mailing list.

ID Team Members

Jacqueline Beidl, Forest Archeologist and Tribal Liaison

Todd Ellsworth, Forest Watershed Program Manager

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Kary Schlick, Fish & Wildlife Biologist

Lisa Sims, Rangeland Management Specialist

Heather Stone, Interagency Vegetation Management Team Leader

Daniel Yarborough, Geospatial Program Manager

Federal, State, and Local Agencies

Adjacent National Forests (Sequoia, Sierra, and Humboldt-Toiyabe); Pacific Southwest Research Station

BLM- Bishop and Ridgecrest Resource Areas

Adjacent National Parks/Monuments (Yosemite, Sequoia/Kings Canyon, Death Valley, Devils Postpile)

Other Federal Agencies (US Geological Survey, US Fish & Wildlife Service, NRCS)

California State Agencies (Fish & Wildlife, State Parks, Transportation, Water Quality Control Board)

Nevada State Agencies (Wildlife, Agriculture, Environmental Protection)

County Commissioners, Agriculture, Transportation, and/or Planning Departments (Esmeralda, Fresno, Inyo, Mono, Madera, Mineral, Tulare)

Tribes

Antelope Valley Indian Community
Benton Paiute Reservation
Big Pine Paiute Tribe of Owens Valley
Bishop Paiute Indian Tribe
Bridgeport Paiute Indian Colony
California Indian Basketweavers Association
Ft. Independence Community of Paiute Indians
Kawaiisu Tribe of the Tejon Indian Reservation
Kern Valley Indian Community
Lone Pine Paiute-Shoshone Reservation
Mono Lake Kutzadika[a] Tribe
Timb-isha Shoshone Tribe - Bishop
Tubatulabals of Kern Valley
Utu Utu Gwaitu Paiute Tribe
Walker River Paiute Tribe
Washoe
Yosemite-Mono Lake Paiute Indian Community

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6. Appendices

Appendix A. Species-Specific Treatment Strategy and Methods

Mapped infestations, treatment strategy, and treatment methods for all currently known invasive plant species on the Inyo NF. Population and acreage information from Inyo NF Weed Inventory Database (NRIS); treatment methods from Di Thomaso et al. (2013), Invasive Species Specialist Group (2008), Tu et al. (2001), and UC Agriculture and Natural Resources (2015). See Table 2 for specific biocontrol agents. There are no invasive plants mapped within RNAs as of January 2018.

Scientific Name	Common Name	# of Popn's	Acres	Occurs in Wilderness	Hand pull/ Dig/Cut	Mow	Tarp/ Solarize	Graze	Flame/ Torch	Bio-control	Animopyralid	Chlorsulfuron	Clethodim	Clopyralid	Fluazifop	Glyphosate	Imazapyr	Triclopyr
Treatment Strategy 1: Eradicate																		
Acroptilon repens	Russian knapweed	2	0.6		x	x				x	x	x		x		x		
Ailanthus altissima	tree of heaven	1	0.5		x						x	x				x	x	x
Centaurea diffusa	diffuse knapweed	4	32		x	x	x		x	x	x	x		x		x	x	
Centaurea solstitialis	yellow star-thistle	2	0		x			x	x		x	x		x		x	x	x
Centaurea stoebe ssp. *micranthos*	spotted knapweed	5	9		x					x	x	x		x		x		
Cirsium arvense	Canada thistle	1	0.2			x					x	x		x		x	x	
Lepidium appelianum	hairy whitetop	6	3			x	x				x	x				x	x	
Lepidium chalepensis	lens-podded hoary cress	2	4			x	x				x	x				x	x	
lepidium draba	heart-podded hoary cress	1	0.002			x	x				x	x				x	x	
Lepidium latifolium	perennial pepperweed	9	5	x	x		x	x				x				x	x	
Linaria dalmatica	Dalmatian toadflax	1	1		x	x		x		x	x	x				x	x	
Linaria vulgaris	butter and eggs	3	2		x	x				x	x	x				x	x	
Spartium junceum	Spanish broom	1	1.3		x					x						x	x	x

Scientific Name	Common Name	# of Popn's	Acres	Occurs in Wilderness	Hand pull/ Dig/Cut	Mow	Tarp/ Solarize	Graze	Flame/ Torch	Bio-control	Animopyralid	Chlorsulfuron	Clethodim	Clopyralid	Fluazifop	Glyphosate	Imazapyr	Triclopyr
Treatment Strategy 2: Control																		
Dipsacus fullonum	Fuller's teasel	2	0.2		x			x	x		x	x		x		x		
Elaeagnus angustifolia	Russian olive	3	0.1	x	x				x							x	x	x
Halogeton glomeratus	saltlover	29	787	x	x						x	x				x		
Rubus armeniacus	Himalayan blackberry	2	0.04		x				x							x		x
Saponaria officinalis	bouncingbet	7	28		x						x	x		x		x	x	x
Tamarix ramosissima	saltcedar	63	613	x	x			x		x						x	x	x
Tribulus terrestris	puncturevine	3	3		x					x		x				x	x	
Ulmus pumila	Siberian elm	3	0.6		x											x	x	x
Treatment Strategy 3: Contain																		
Bassia hyssopifolia	fivehorn smotherweed	12	48	x	x	x					x	x				x	x	
Bromus madritensis ssp. *rubens*	red brome	131	5,162	x	x			x		x	x	x	x		x	x	x	
Bromus tectorum	cheatgrass	431	32,286	x	x					x	x	x	x		x	x	x	
Cirsium vulgare	bull thistle	9	451	x	x	x		x	x	x	x	x		x			x	x
Convolvulus arvensis	field bindweed	1	1		x		x				x	x				x	x	x
Hirschfeldia incana	shortpod mustard	1	0.003		x							x				x		
Holcus lanatus	common velvetgrass	2	57	x	x			x	x						x	x		
Lotus corniculatus	bird's-foot trefoil	3	4	x	x						x			x		x		x
Marubium vulgare	horehound	4	4		x													x
Melilotus sp.	sweetclover	46	143	x	x				x							x	x	x
Penstemon subglaber	smooth penstemon	4	3		x		x									x		
Robinia pseudoacacia	black locust	3	39								x			x		x	x	x
Salsola tragus	prickly Russian thistle	169	1,977	x	x	x		x	x	x	x	x				x	x	x
Sonchus oleraceus	common sowthistle	1	0.2		x			x						x		x		

Scientific Name	Common Name	# of Popn's	Acres	Occurs in Wilderness	Hand pull/ Dig/Cut	Mow	Tarp/ Solarize	Graze	Flame/ Torch	Bio-control	Animopyralid	Chlorsulfuron	Clethodim	Clopyralid	Fluazifop	Glyphosate	Imazapyr	Triclopyr
Treatment Strategy 4: Limited or No Treatment																		
Bromus diandrus	ripgut brome	6	3		x	x		x		x	x	x	x		x	x	x	
Bromus japonicus	field brome	2	5		x			x	x	x	x	x				x		
Ceratocephala testiculata	curveseed butterwort	4	1								x	x				x	x	
Chorispora tenella	crossflower	2	2		x						x	x				x		
Descurainia sophia	herb sophia	72	939	x	x											x		
Erodium cicutarium	redstem stork's bill	38	287	x	x				x		x	x				x	x	
Grindelia squarrosa var. *serrulata*	curlycup gumweed	2	13.7		x						x	x				x	x	
Hordeum murinum	foxtail barley	1	0.004		x	x			x				x		x	x	x	
Lactuca serriola	prickly lettuce	5	0.3		x	x					x			x		x		
Malva neglecta	common mallow	6	3		x													
Poa bulbosa	bulbous bluegrass	7	2		x			x					x			x	x	
Polygonum arenastrum	oval-leaf knotweed	18	32	x	x						x					x	x	
Polygonum aviculare	prostrate knotweed	1	0.01		x						x					x	x	
Polypogon monspeliensis	annual rabbitsfoot grass	7	1	x	x	x		x	x			x	x		x	x	x	
Rumex crispus	curly dock	3	15			x					x	x		x		x	x	x
Schismus arabicus	Arabian schismus	32	181	x				x					x		x	x		
Sisymbrium altissimum	tall tumblemustard	50	158	x	x	x	x	x	x		x	x				x	x	x
Spergularia rubra	red sandspurry	2	1		x											x		
Taraxacum officinale	common dandelion	52	2,056	x	x											x		
Tragopogon dubius	yellow salsify	13	368	x	x			x								x		
Trifolium repens	white clover	1	0.1		x		x									x		
Verbascum thapsus	common mullein	58	107	x	x	x					x	x				x	x	
Vulpia myuros	annual fescue	3	5		x			x	x				x		x	x		

Appendix B. INF Invasive Plant Treatment and Monitoring Form

Date: **Examiners:**

Site Name: **Species/Infestation ID:**

Site Description/Location/Habitat/Uses in Area:

Infestation Size (approx.):

Cover (%) or number of individuals/stems:

Distribution: Grouped/Clumped Linear Even Variably Patchy

Phenology:	**Forb**	**Shrub**	**Graminoid**
	Rosette	Vegetative	Leaves partially Developed
	Bolt	Flowering	Inflorescense "in the boot"
	Flowering	Fruit	Flower partially/fully extended
	Fruit	Senescent	Seeds maturing/mature
	Senescent		Senescent

Distance to water (if <500ft): Horizontal (ft): Vertical (ft):

PREVIOUSLY TREATED?

TREATMENT CONDUCTED (Method, # of People, Time Spent, % Treated):

<u>Herbicide Application</u>

Product Name: **Dilution (%):**

Quantity Applied (oz or gal): **Application Rate (gal/acre):**
(when spraying)

TREATMENT EFFECTIVENESS (Monitoring Date, Effects, % Cover, Changes Needed):

Appendix C. Region 5 FSH 2509.22, Chapter 10 and National Best Management Practices (USDA 2011)

Section 12.51, Exhibit 07

BMP 5.7 - Pesticide Use Planning Process

Objective: To introduce water quality and hydrologic considerations into the pesticide use planning process.

Explanation: The pesticide use planning process is the framework for incorporating water-quality protection requirements contained in BMPs 5.8 through 5.14 into project design and management. The project environmental document will incorporate these considerations in discussion of environmental effects and mitigation measures.

Implementation: The interdisciplinary team will evaluate the project in terms of site response, social and environmental impacts, and the intensity of monitoring if needed. The responsible line officer will prepare environmental documentation, project plan, and the safety plan. Project plans and safety plans will specify management direction. Approval for proposed pesticide projects will proceed according to direction established in Pacific Southwest Region supplement No. 2100-95.1 to 2150.

Section 12.51, Exhibit 08

BMP 5.8 - Pesticide Application According to Label Directions and Applicable Legal Requirements

Objective: To avoid water contamination by complying with all label instructions and restrictions for use.

Explanation: Directions on the label of each pesticide are detailed and specific, and include legal requirements for use.

Implementation: Constraints identified on the label and other legal requirements of application must be incorporated into project plans and contracts. For force account projects, the Forest Service project supervisor (who will have a Qualified Applicator Certificate) is responsible for ensuring that label directions and other applicable legal requirements are followed. For contracted projects, the contracting officer, or the contracting officer's representative will be responsible for ensuring that label directions and other applicable legal requirements are followed.

Section 12.51, Exhibit 09

BMP 5.9 - Pesticide Application Monitoring and Evaluation

1. **Objective**:

a. To determine whether pesticides have been applied safely, were restricted to intended target areas, and have not resulted in unexpected non-target effects.

b. To document and provide early warning of hazardous conditions resulting from possible pesticide contamination of water or other non-target areas.

c. To determine the extent, severity, and duration of any potential hazard that might exist.

Explanation: This practice documents the accuracy of application, amount applied, and any water quality effects so as to reduce, or eliminate hazards to non-target species. Monitoring methods include spray cards, dye tracing (fluorometry), and direct measurement of particles in, or near water. Type of pesticide, type of equipment, application difficulty, public concern, beneficial uses, monitoring difficulty, availability of laboratory analysis, and applicable Federal, State, and local laws and regulations are all factors considered if it becomes necessary to develop a monitoring plan.

Implementation: If there is a need to develop a monitoring plan, it will be identified during the pesticide use planning process as part of the project environmental evaluation and documentation.

2. The water-quality monitoring plan would specify:

a. Who will be involved and their roles and responsibilities;

b. What parameters will be monitored and analyzed;

c. When and where monitoring will take place;

d. What methodologies will be used for sampling and analysis, and the rationale behind each of the preceding specifications.

A water-quality specialist and the project leader will evaluate and interpret the water-quality monitoring results in terms of compliance with and adequacy of project specifications.

Section 12.51, Exhibit 10

BMP 5.10 - Pesticide Spill Contingency Planning

Objective: To prevent water contamination resulting from cleaning, or disposal of pesticide containers.

Implementation: Pesticide spill contingency planning will be incorporated into the project safety plan. The pesticide spill contingency plan prepared by each forest consists of predetermined actions to be implemented in the event of a pesticide spill. The plan lists who will notify whom and how, time requirements for the notification, guidelines for spill containment, and who will be responsible for cleanup. The site-specific environmental evaluation and resulting documentation will include public and other agency involvement in plan preparation. The plan will list the responsible authorities.

Section 12.51, Exhibit 11

BMP 5.11 - Cleaning and Disposal of Pesticide Containers and Equipment

Objective: To prevent water contamination resulting from cleaning, or disposal of pesticide containers.

Explanation: The cleaning and disposal of pesticide containers must be done in accordance with Federal, State, and local laws, regulations, and directives. Specific procedures for the cleaning and disposal of pesticide containers are documented in the Forest Service Pesticide Use Management and Coordination Handbook (FSH 2109.114), and State and local laws.

Implementation: The forest, or district Pesticide Use Coordinator (Qualified Applicator) will approve proper rinsing procedures in accordance with State and local laws and regulations, and arrange for disposal of pesticide containers when Forest Service personnel apply the pesticide. When a contractor applies the pesticide, the contractor will be responsible for proper container rinsing and disposal in accordance with label directions and Federal, State, and local laws.

Section 12.51, Exhibit 12

BMP 5.12 - Streamside Wet Area Protection during Pesticide Spraying

Objective: To minimize the risk of pesticides inadvertently entering waters, or unintentionally altering the riparian area or wetland.

Implementation: Appropriate width buffers will be established for spraying pesticides near water bodies. Factors considered in establishing buffer strip widths are beneficial water uses, adjacent land uses, rainfall, wind speed, wind direction, terrain, slope, soils, and geology. The persistence, mobility, acute toxicity, bio-accumulation, and formulation of the pesticide are also considered. Equipment used, spray pattern, droplet size, and application height and past experience are other important factors. Perennial and intermittent surface waters, wetlands, and Riparian Conservation Areas (RCAs) will be identified from onsite observation, and mapped during project planning. When included as part of the environmental evaluation and documentation, the project work plan, the protection of surface waters, wetlands, or RCAs will be the responsibility of the project supervisor for force account projects, and the COR will be responsible on contracted projects.

Section 12.51, Exhibit 13

BMP 5.13 - Controlling Pesticide Drift during Spray Application

Objective: To minimize the risk of pesticide falling directly into water, or non-target areas.

Implementation: The spray application of pesticide is accomplished according to prescription which accounts for terrain and specifies the following: spray exclusion areas; buffer areas; and factors such as formulation, equipment, droplet size, spray height, application pattern, and flow rate; and the limiting factors of wind speed and direction, temperature, and relative humidity. An interdisciplinary team will prepare the prescription, working with the Forest or District Pesticide Use Coordinator during project planning. For force account projects, the Forest Service project supervisor will be responsible for ensuring that the prescription is followed during application and for closing down application when specifications are exceeded. On contracted projects, the contracting officer, or the contracting officer's representative will be responsible for ensuring that the prescription is followed during application and for closing down application when specifications are exceeded.